EXECUTIVE DOCUMENTS

PRINTED BY ORDER OF

THE HOUSE OF REPRESENTATIVES

DURING THE

SECOND SESSION OF THE THIRTY-FIFTH CONGRESS,

1858-'59.

IN THIRTEEN VOLUMES.

WASHINGTON:
JAMES B. STEEDMAN, PRINTER.
1859.

INDEX

TO

THE EXECUTIVE DOCUMENTS

OF THE

HOUSE OF REPRESENTATIVES OF THE UNITED STATES,

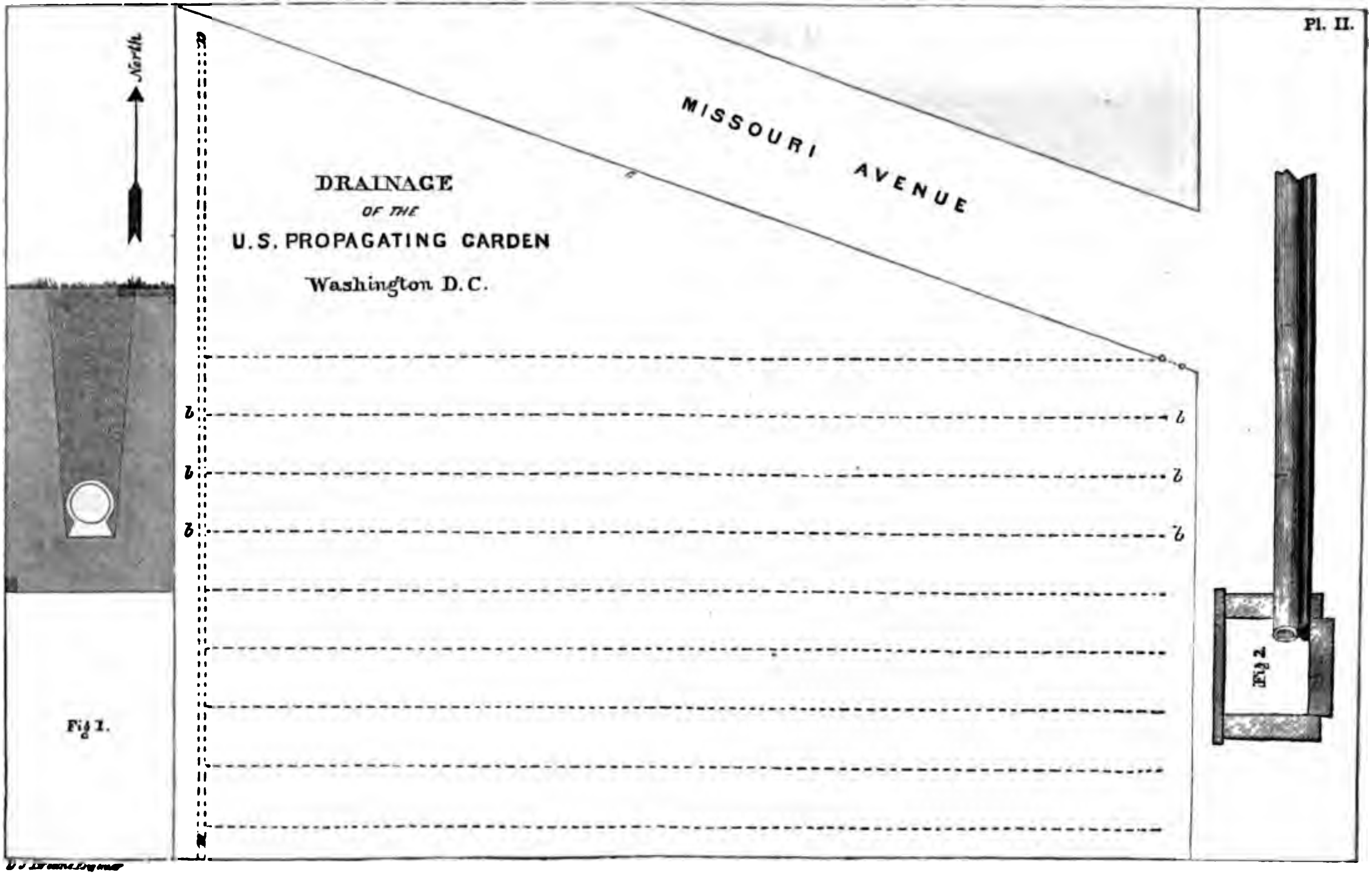
OF

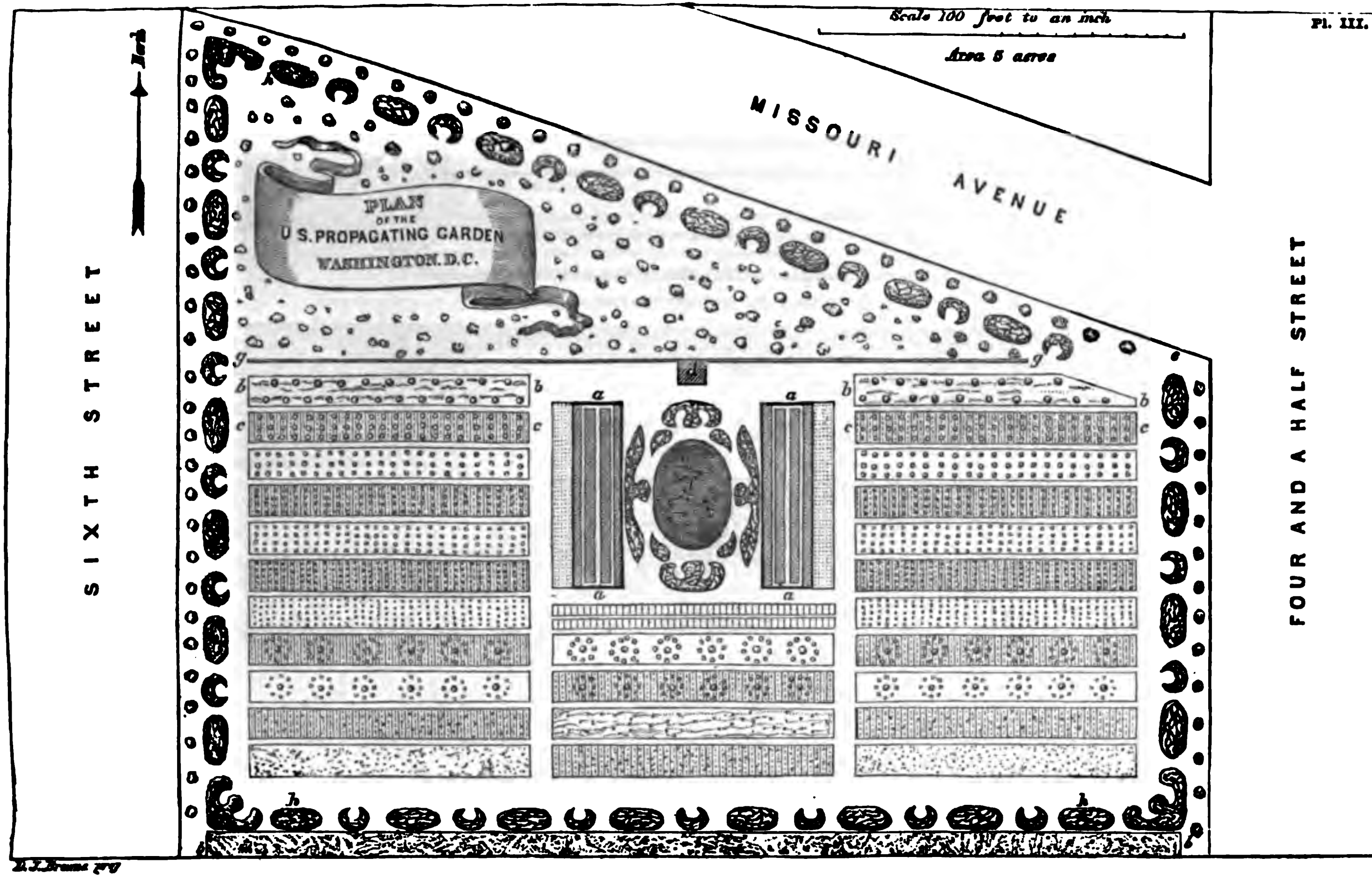
THE SECOND SESSION THIRTY-FIFTH CONGRESS.

N.

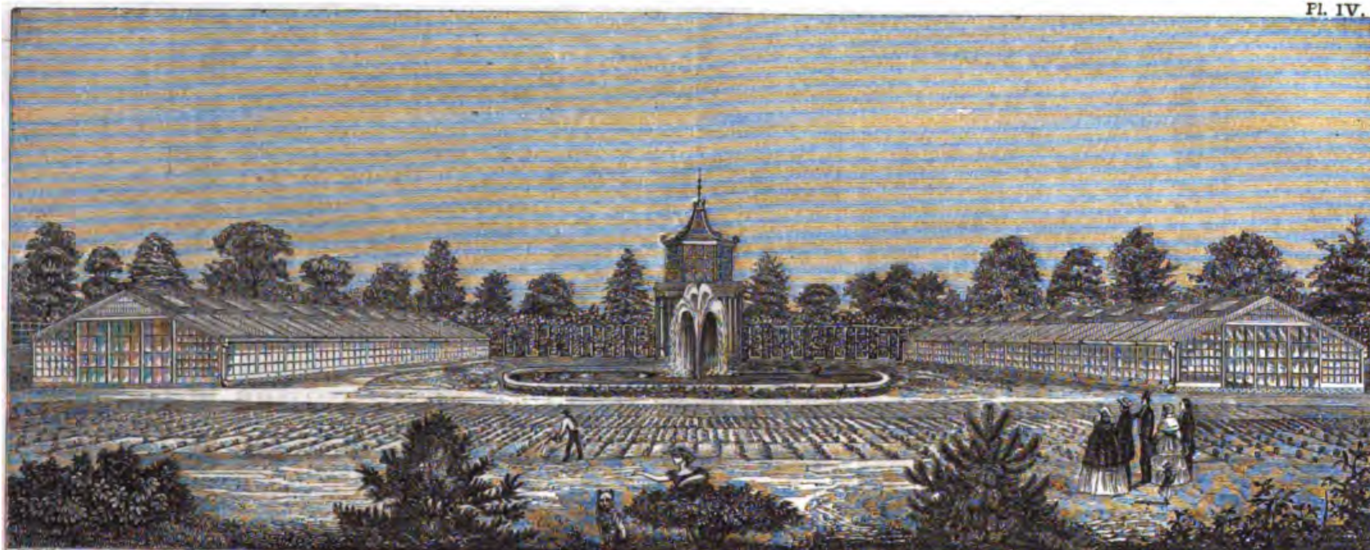
Pl. I.

YAK OF THIBET
Bos grunniens.

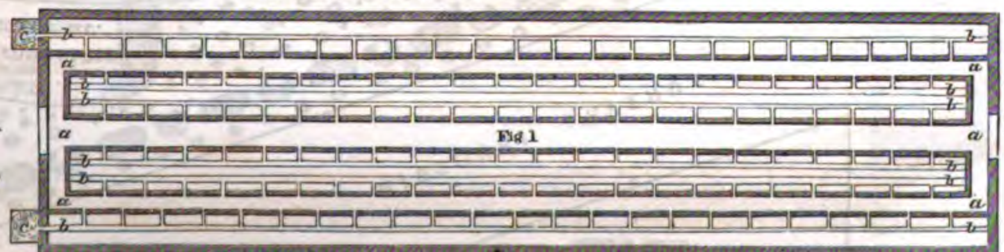

DRAINAGE
OF THE
U.S. PROPAGATING GARDEN
Washington D.C.
MISSOURI AVENUE
North
a
b
b
b
b
b
b
Fig 1.
Fig 2.

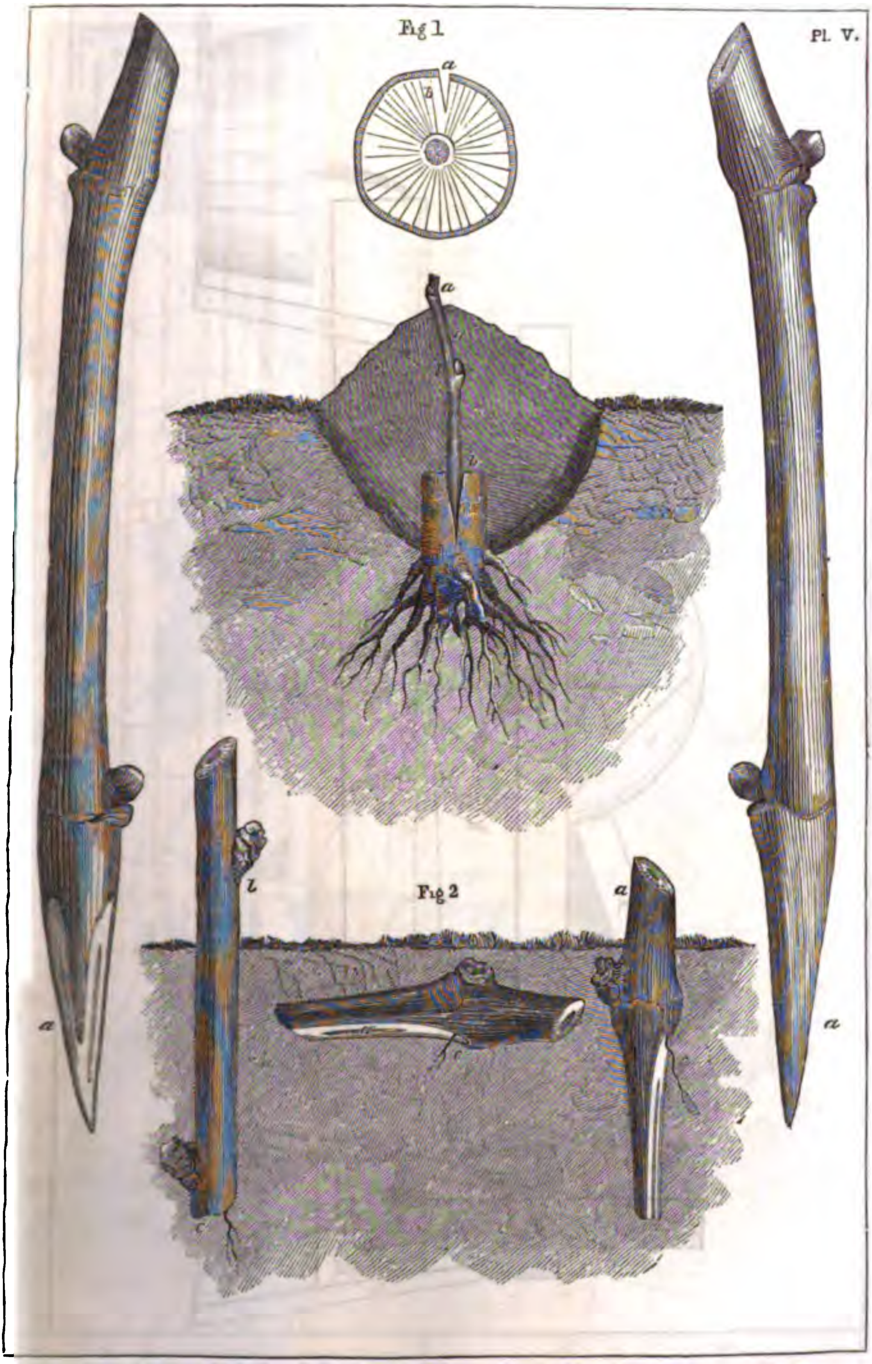

Pl. III.
Scale 100 feet to an inch
Area 5 acres
MISSOURI AVENUE
PLAN OF THE U.S. PROPAGATING GARDEN WASHINGTON. D.C.
SIXTH STREET
FOUR AND A HALF STREET
North

Pl. IV.



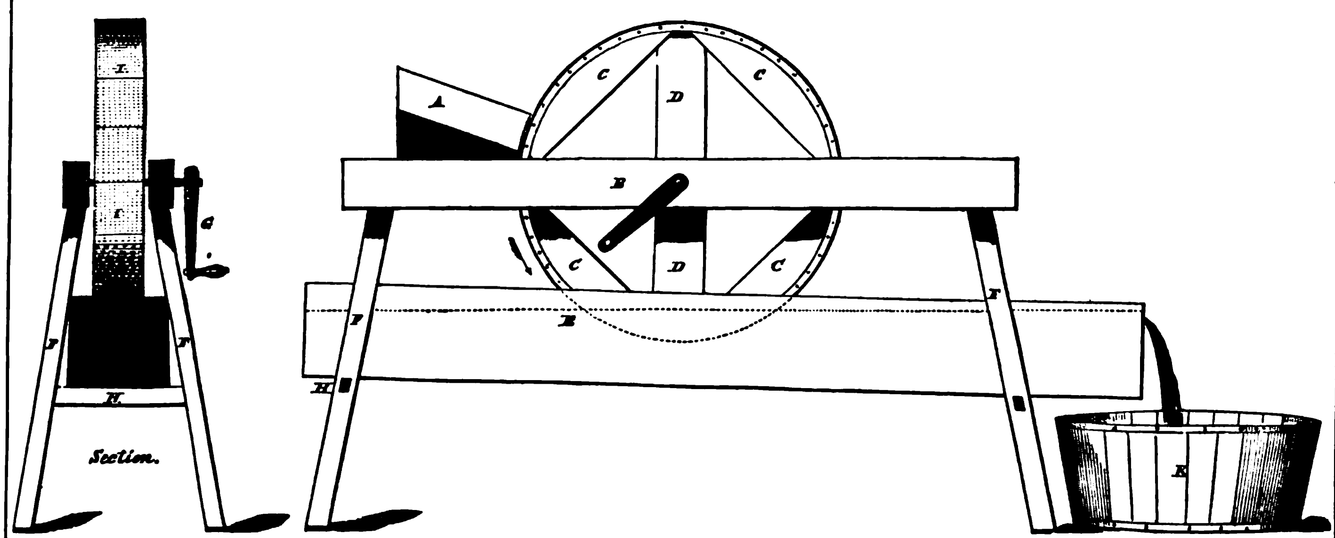
U. S. PROPAGATING GARDEN WASHINGTON. D.C.





PROPAGATION OF THE GRAPE-VINE

Pl. VI.



ARROW-ROOT RASPING MACHINE

Pl. VII


REFERENCES
Regions naturally woody
Prairies cultivable without irrig.n
Regions sterile or requiring irrig.n
Prevailing winds bearing moisture
Winds accompanied by dryness
a
b
c

Pl. VIII.

SURFACE WINDS.

CURRENTS OF THE OCEANS

35TH CONGRESS, 2d Session. } HOUSE OF REPRESENTATIVES. { Ex. Doc. No. 105.

REPORT

OF THE

COMMISSIONER OF PATENTS

FOR THE YEAR 1858.

AGRICULTURE.

WASHINGTON:
JAMES B. STEEDMAN, PRINTER
1859.

IN THE HOUSE OF REPRESENTATIVES, *March* 2, 1859.

Resolved, That there be printed, in addition to the usual number, two hundred and ten thousand extra copies of the Report of the Commissioner of Patents on Agriculture for the year 1858, ten thousand copies of which shall be for distribution by the Interior Department: *Provided*, That the aggregate number of pages contained in said Report shall not exceed five hundred and sixty-eight, including ten pages of illustrations on wood. *And provided further*, That the entire amount of copy necessary to complete said Report, including the drawings for the illustrations on paper, be placed in the hands of the Superintendent of the Public Printing on or before the first day of June next.

Attest: J. C. ALLEN, *Clerk*.

REPORT

OF THE

COMMISSIONER OF PATENTS.

UNITED STATES PATENT OFFICE,
February 25, 1859.

SIR: Agreeably to the design of Congress, as indicated in the clause of the act of June 12, 1858, "for collection of agricultural statistics, investigations for promoting agricultural and rural economy, and the procurement of cuttings and seeds," I have the honor herewith to transmit the agricultural portion of my Annual Report.

At the present brilliant epoch in an age of progress more eventful than any which has preceded it, the world seems to have reached a just appreciation of the relative values of facts and theories, and agricultural statistics have assumed importance alike in the eyes of the intelligent farmer, the manufacturer, and the political economist. With the exception, however, of the Census returns of the last two decades, but little has been done in this country towards the collection and arrangement of the results of the operations of a single year, or of a series of years, in such form as would exhibit either a history or explanation of agricultural improvements or decline. With the startling facts before us that, instead of full and abundant crops in many parts of the older-settled portions of our territory, the fields do not yield at present half as much as formerly, and, in many localities, not a third, nor even a quarter as much, without the application of extraneous manures—that, notwithstanding the abundance and cheapness of our virgin soil, the advantages of climate, the facility of transportation to available markets, and the untrammelled, lightly-taxed and independent condition of our farmers and planters, the ratio of increase of the agricultural products of the United States is far below that of the increment of population, accession of territory, extension of commerce, manufactures, internal improvements, and the modern

appliances for economizing labor—this Office felt justified, for the purpose of devising an expeditious and effectual mode of collecting agricultural statistics, by inviting a number of intelligent agriculturists from different sections of the Union to convene at Washington, with the view of imparting a knowledge of such facts in practical husbandry as might have come under their observation and experience, and to suggest means by which our crops might be increased, improved in quality, or made more profitable to the producer. In accordance with this invitation, an assemblage of citizens from most of the States and Territories convened at this Office on the 3d day of January, 1859, who resolved themselves into an "Advisory Board of Agriculture of the Patent Office," and continued in session eight days. In the course of their deliberations it was unanimously recommended—

That, in order to carry out successfully the above-named objects, Congress should by law provide for the enlightenment of the people by encouraging scientific and practical education in agriculture, in the establishment of colleges and schools.

That, from the manner in which the Agricultural Division of the Patent Office is conducted, no change in legislation by Congress is required, except increased appropriations annually for the promotion of objects similar to those which have been made and adopted heretofore.

That the operations of the Patent Office, in connection with the Smithsonian Institution, in collecting meteorological facts, be continued, as well as the experiments now being made for the introduction of the tea-plant, and the extension of the cultivation of the vine.

That the illustrations of the Agricultural Reports should be strictly accurate, and colored if essential, though with due regard to economy, to insure which objects, they should be executed under the exclusive control of the Department of the Interior.

In visiting, as a body, the various apartments and appurtenances connected with this division, with the view of witnessing its working condition, the Board pronounced the results satisfactory, and no alterations were suggested. They also unanimously expressed the opinion that the introduction of trees, plants, cuttings, &c., by government, has been attended by benefits to the people infinitely greater than all the expenses incurred.

The remainder of the sessions of the Board were chiefly devoted

to the revision of a series of interrogatories previously prepared by this Office, for eliciting information directly from the farmers of the country, and to the reading of papers on agriculture, several of which, as well as the former, appear in another part of the present volume.

This Office, with the co-operation of the Smithsonian Institution, has, during the past year, continued its investigations in the physical condition of the United States, as an important aid in determining the adaptation of the soil and climate to particular products. The meteorological stations have been increased; appropriate blanks, rain-gauges and other instruments have been placed in the hands of observers, and ample returns have been received, which have been reduced to a proper form for publication. It was stated before the Advisory Board that these observations would be specially applicable to the prevention of the evils consequent upon the overflows of the lower Mississippi by placing river-gauges under the charge of reliable persons along this river, and rain-gauges at different points in the regions adjacent to its northern tributaries for the regular transmission of reports of the amounts of rain and snow fallen, to convenient points for timely publication. By means of a series of observations, for a number of years, throughout the valley a system could be devised by which the residents of the low country would be able to prevent incalculable losses, often comprehending millions in the sacrifice of unharvested crops and plantation improvements, which would seem to justify the outlay that these observations would incur.

The agent employed to visit China for the purpose of collecting the seeds of the tea-shrub and of other plants, when last heard from' had been successful in his mission, and was about to ship considerable quantities to the United States, which are presently expected to arrive. In order to secure the safe propagation of the tea-plants, preparatory to their removal to the sites where the experiments are ultimately to be made, a portion of the public grounds in the city of Washington has been set apart, thoroughly under-drained with tiles, and a propagating house erected thereon for the germination of the seeds. In consequence of the length of time required for the transmission of seeds from China to the United States, and the accidents to which they must unavoidably be exposed, this Office has taken

measures to procure tea seeds of the same species from Brazil. From further investigations of our soil and climate, and of the history of a former attempt to introduce the culture of this important plant, I am strongly encouraged to anticipate the success of the pending experiment.

With the view of increasing the products and improving the rural skill and industry of the United States, this Office has availed itself of the services of a gentleman visiting various countries of Europe to procure the seeds and cuttings of such trees, shrubs, and plants as may be adapted to our economy, to learn in detail the processes employed in the preservation and manufacture of their fruits, and to obtain such other information and articles of interest as may hereafter be desirable.

In prosecuting the extension of the grape and wine-culture of the United States, several thousand cuttings of the Zante currant vine and of other grapes have been obtained from the Ionian Isles, as well as large quantities of the acorns of the cork-tree from the south of Spain, all of which have been distributed in portions of our territory, where it is believed that they will thrive. Considerable quantities of the seeds and cuttings of our native grapes have been obtained from various parts of the Union and planted on the ground alluded to above, with the object of producing new varieties, and of testing their adaptation to the climate of various sections of the country and their value for table use and for making wine. From the zeal and lively interest manifested in the grape culture in this country, and its unprecedented increase, we are led to expect that these experiments will be crowned with success.

Two chemists have been commissioned at different points in the Union to make investigations in the quantitative analyses of the ash of the tobacco plant, and of the soils in which it grows, with the object of determining its influence on the land, and assigning to it a proper place in the rotation of crops, both of whom are prosecuting their inquiries, the results of portions of which appear in another part of this volume.

The entomologist employed to experiment upon the insects infesting the orange groves and cotton fields, in Florida, the past season, has brought his labors to a close, the results of which are also embraced in the present volume.

Among the seeds and tubers which have been imported or made the subject of experiment in this country within the last year, it may be stated that the Bald Barley, from Italy; the Polish Wheat, or Giant Rye, and Turnip seed, from England; the Chufa, from Spain; and several varieties of wheat, of domestic growth, bid fair to surpass all that was anticipated.

The experiments with the Chinese Sugar-cane have proved eminently successful throughout portions of the Southern, Middle, and Western States, 100,000 acres, by estimate, having been occupied with it the past season, attended with at least a net profit of $2.000,000, in fodder, sugar, and syrup, and other economical uses.

The seeds of new and improved varieties of culinary vegetables and ornamental flowers have been widely disseminated throughout the country—especially in the western and newly-settled districts, where most of them had been little known—and it is gratifying to be able to state, upon the authority of credible reports, that the success and appreciation of them have served to excite a general interest in their culture.

Although the instances herein given are sufficient to show that millions have already been returned to the country in profit for the thousands expended by Government, the greatest advantages doubtless lie in the schemes to which allusion has been made, which require a longer time for their execution. In proof of the general success of these efforts, it is worthy of remark that, within the last four years, the number of Agricultural Societies in the United States—the statistics of which, commenced in the Agricultural Report of 1857, are continued as fully as the information thus far obtained will permit—has increased in a ratio of two or three fold, and that the members of these societies have augmented in a still greater ratio, while agricultural schools and colleges are being formed in several of the States, with promise of a race of intelligent farmers such as few countries have ever possessed—men familiar alike with the teachings of science and the duties of the field.

All of which is respectfully submitted.

J. HOLT,
Commissioner.

Hon. JAMES L. ORR,
Speaker of the House of Representatives.

EDUCATION.

ELEMENTARY AND PRACTICAL EDUCATION, CONSIDERED IN CONNECTION WITH THE PRIMARY AND AGRICULTURAL SCHOOLS OF THE UNITED STATES.

BY D. JAY BROWNE.

EVERY reflective and liberal mind, when it takes a view of the various countries of the globe, and the customs of nations and the different tribes of the human family, finds that they often submit to the most absurd and unnatural usages for ages; and even at the present time civilized man, as he ever has been, presents, in these respects, a most singular aspect and position. He appears to be a compound of extremes—possessed of vast intelligence, science, and perfection of the arts, as a united body, yet his mind, taken singly, and examined apart from his vital energies, is often found to be deficient in a knowledge of the right use of his sensitive organs, and unqualified to deduce proper conclusions from many of the objects to which they are directed, whence he passes through life without any rational application of the senses and faculties with which he is furnished. These apparent anomalies and inconsistencies in the perception of man and the operations of Nature may be attributed, in a great degree, to the different systems of schools established in past ages, and sustained, more or less, by the law of custom, when civilization and the arts were in their infancy, and when the foundation of teaching and cultivating the human mind began in superstition, feebleness, and error. Although custom is often found to be incompatible and diametrically opposed to the laws of Nature, yet, when it is covered with the venerable mantle of antiquity, and has been made the constant companion of man from infancy, it then becomes a second nature, which it is not expected he will change or surrender, as it has laid the foundation of all his knowledge, or acquirements. Indeed, with few exceptions, it would seem to be unreasonable to expect that he would change or surrender the law of custom, at a late period, for the law of Nature, as the former has usurped the full power and taken firm hold in his mind, and spread its fruits as a tree in fertile ground. Therefore, to ask adult mankind to change their long-established customs and systems, would argue a want of knowledge of the planting, culture, and growth of the human mind. Consequently, all great

changes in education must be commenced in infancy, immediately from the mother's arms.

Although there are millions who know that there is something wrong in the present system of education, yet it is exceedingly difficult to discern the cause, as we are, in a measure, all brought up in the same error, so that it requires unusual efforts to remove the veil of custom which shrouds the truth. But when the cause is once discovered, the remedy will naturally follow. The infant mind, educated by the laws of Nature, soon reveals its true and real genius by its amazing facility in the acquisition of a language, whatever may be its perfection, as well as conforming to any state of intelligence by which it may be surrounded. With the same facility it acquires the most refined and elegant manners, so that the progress of the child, under Nature's laws, is almost infinite, and is a demonstration of the capabilities of the mind to attain universal knowledge, according to its inherent faculties or propensities. The great object of research, then, in the study of man, is to discover his real nature, genius, and attributes, before he becomes the creature of custom and habit, in other words, an artificial being. When we examine the child from his birth, we perceive, at once, his forlorn and helpless state; that he is the most feeble being of the entire creation; and here we behold the type of a part of his character, and the most important to be perfectly understood, that everything must be done for him; here also we perceive the infant mind as a *carte blanche* giving unlimited power to others to write and imprint upon it every species of knowledge possessed by man—whether one language or ten, one science or all sciences, as the little pupil imitates his mother or nurse in her language, manners, and in any degree of civilization she may possess. In short, with rare exceptions, in whatever part of the world, or amongst whatever people, nation, or tribe he may be born, he will represent, in a short space of time, with wonderful accuracy, the miniature of the state of things by which he may be surrounded—of the language, laws, and customs, of whatever kind they may be—of the habits and degree of polish of the family in which he is placed, let it be ever so exalted or debased, whether good or bad, ignorant or intelligent, savage or civilized. Hence, the infant mind, in the course of two or three years, may arrive at a state of civilization which has cost nations ages to produce; and yet, during the same period, subsisting under other circumstances, it may be found in the opposite extremes—in the most abject state of barbarism—and it is obvious that both of these states are produced by the immutable laws of Nature. This being evident and incontestible, the deduction, therefore, is equally clear and incontrovertible, that Nature can only perform her operations according to the quantity and quality of the materials with which she is supplied; it is equally demonstrable that she is all-powerful, faithful, and certain in perfecting her works. Supply her with the elements, in her own way, manner, and fashion, as exhibited by the cautious and benign mother from the creation. The mother, therefore, possesses the true and Divine attributes for teaching and educating her offspring. Every faculty in the art is

congenial to her nature; she is endowed expressly by Deity to be the example and guide to all teachers or professors who may follow. Let us search the whole field of inquiry for a model system for teaching, and we shall never find one more beautiful, perfect, or powerful than hers; for by the Divine laws, all Nature begets its kind—Nature reflects Nature—the infant reflects its mother and the imprint of all her charms is perfect. She always fascinates, cheers, and amuses her pupil, illustrates and embodies what she teaches, by which means the passions are harmonized, the soul is fructified in knowledge, a language engraved, and the child at once assimilates himself to the state and conception of its parent.

From the preceding observations it would be natural to expect that the growth of intelligence in children would continue in the same ratio as it commenced, that it would be attainable in accordance with the common laws of arithmetic; for instance, following the system of the mother, if a child acquire the art of speaking one language at two years old, how many languages would it speak at the age of twelve years, allowing the capacity to grow in strength as it proceeds? A fair and correct answer would be, six living languages, besides a considerable knowledge in the arts and sciences, such as reading, writing, astronomy, geography, botany, geology, mechanics, music, etc. This answer giving the enumeration of acquirements to be fairly engraved upon the mind of a child of twelve years is quite in harmony and analogous to its first period of tuition under the natural system of the mother.* But unfortunately the system of the schools for ages has settled and determined that the *elementary book* shall be the general field for the mind to grow in, from which it shall receive its nutriment and expansion. The professors, grammarians, and book-makers have exerted all their powers and skill to bring these elementary books to perfection; and it must be admitted by all that they are brought to great perfection, notwithstanding there are many old elementary books quite as comprehensive as the new; yet there is something remarkable about them that seems to throw a doubt and even a mystery in the minds of the professors themselves, as every generation produces a new swarm of geographies, arithmetics, grammars, and other elementary books, which not only shows that there is still something wanting, and that the fault, in a great measure, must necessarily be in the book. And as every one may be said to have been educated in the elementary book, the ingenious authors have made new ones with improved arrangements and more liberal explanations, and have elucidated them in a clear and popular manner, in order that the children and youth may sooner and better understand the sciences and languages of which they treat. But as long as these elementary books are made the ground-work and main foundation of schools, per-

* There may be cited at the present time thousands of examples in the world, of infants of three years of age who possess the knowledge and art of speaking two distinct languages as practiced in all border countries, and the same advantages and results are accomplished when families hire a foreign nurse, the infant invariably speaking two languages at the same period. A surprising example is on record of the great powers of a child only seven years old, who spoke five languages which were acquired in the natural way by means of foreign nurses, in consequence of having resided in different countries.

fection in the art of teaching will never be accomplished. Yet, the system of the schools has decided otherwise. By means of these elementary books, the pupil is doomed to extract and unravel all the mysteries of science and art; and by means of these dumb idols, too, he is compelled to learn many languages, so as to acquire and become acquainted with all their infinite changes and variations, with all their exceedingly delicate sounds and harmonies; and yet they possess neither voice nor speech, thus usurping all the powers and faculties of man. The book, then, is an inanimate, finite and limited agent, containing only the shadows of knowledge, and consequently devoid of all inspirations of Nature's voice, devoid of all sounds, harmonies, and the infinite variations in speech, which must, of necessity, accompany every language as well as any kind of knowledge or science whatsoever that is really engraved and fixed upon the brain, being devoid of all actions, and must be pronounced by the faithful investigator as an educator utterly deficient and inadequate to the work which has been so long imposed upon it; and yet such is the system of the schools that it is the professor and schoolmaster, and not the *living man*; thus the art of teaching is turned over to the book for the young mind to puzzle out its mysteries, and consequently education is guided by the weakest power. The very moment the professor is made and becomes the teacher and educator, he follows the same vital system as the natural mother, using and exercising man's immortal gift—speech—in demonstrating and illustrating the truth, the mind of the pupil will receive the impressions of all knowledge, and will develop its perfection. In illustration of this, it must be evident to all that in the Church, the ministers, by their vital powers, expound the Divine laws and science of religion. In the State, the politician audibly explains and illustrates his profound meditation on his system of politics for the well-being and protection of the millions. At the Bar, the counsellors argue and demonstrate the laws and science of jurisprudence, and the judge, a true teacher of Nature, who knows the laws as perfectly as the mother knows her native tongue, instructs and enlightens the jury in a like manner, demonstrates the laws, analyzes, unfolds, and dissects the various and contending elements of the evidence, making them comprehend and understand, and thus developing the truth. To carry the illustrations still further, suppose one were to place a great book of the laws on the seat of justice, and say to the gentlemen of the jury "There is your guide, decide the case according to the written laws," instead of the real living and immortal mind of the judge, whose learned research and sharp acumen traverses the vast and massy heaps of the written law in a moment, and unravels all its intricacies, in the shortest space of time, draws out the truth, analyzes the case, and lays it open as clear as the light of day. Imagine what would be the task of the jury to have the book instead of the judge for their teacher and guide, and the inevitable result of such a system. But let it be understood that the writer is not opposed to books in whose pages are recorded everything relating to the glory and debasement of man, his strength and weakness, his perfections and imperfections. and all things essential,

valuable, and vital to his happiness. In the works of the renowned races of ancient Rome, Greece, and Egypt, as well as the lore of that primitive people, the Hebrews, are described, full of sublimity and classic grandeur, vast and mighty deeds, and extensive mechanical powers in the art of the destructive elements of war—marvellous even to the present generation—or in the more rational arts of peace. In books, too, are described the heavens and the firmament, the different orders, magnitudes, and wonderful movements of the stars, or the worlds and suns above; the true nature and properties of the elements which envelop our globe, the dwelling places and dominions of men; a full account of those vast treasures and gifts which grow and live upon the surface, as well as those which are deposited in its bosom, including a description of the properties, qualities, and uses of the vast treasures of the deep, with their various orders, affinities, links, harmonies, beauties, elegancies, and marvelous adaptations. In a word, all knowledge is registered and deposited in their pages so far as the first glance strikes the unreflecting mind; but they do not regale the docile mind of infant man with the vivid charms of all realities which engage the innate faculties of his youthful soul. Alas, all these vast treasures of knowledge are only marked in science and black hieroglyphics belonging entirely to the order of shadows and finite things; whereas the vital teacher belongs to the infinite order, possessing all the brilliant, animating, electrifying and fructifying powers of a living spirit, who alone has the faculty of producing those pleasing qualities, and making the pupils hear, see, feel, touch, handle, taste, and smell, as well as converse, through the marvellous gift of speech, upon all the treasures of science, and play the sweet sounds of music and the varied harmonies of many tongues.

In viewing our elementary school system, as it at present exists, and as a preparatory step to entering the agricultural colleges now going into operation in the United States, especially those of the middle and northern sections, it is obvious that unexpected difficulties will arise from the circumstance that the young pupils, as a general thing, on entering will not be sufficiently advanced in the rudiments of knowledge to profit by the instructions these institutions will be calculated to impart. For them to enter with any attempt to build without a proper foundation would most assuredly be attended with many disadvantages; for in all cases, unless they are prepared to deduce their lessons, it would certainly end in a failure. Let us be permitted, then, to suggest that these large establishments, so munificently endowed, and which promise so much benefit to the community, be first converted into normal agricultural schools and model farms for the education of teachers and other persons somewhat advanced in knowledge, preparatory to their entering upon business or other active duties of life. The success of an institution of this kind would depend, however, in a great measure, upon its principal, who should not merely be the educator, but the constant companion and guide of his students, laboring, resting, and playing with them, as well as instructing and explaining everything to them; one whom they could love because he is amiable and kind; reverence because

of his age and character; and respect from his possessing a fund of knowledge, which it would be useful for them to draw from on all occasions, and to whom their curiosity could always apply and be gratified. But agriculture, in its proper sense, can never be intelligibly and successfully taught without a thorough acquaintance of the operations of Nature, by ocular, oral, and tangible instruction in early life. For one of the great advantages which children derive from the study of the natural sciences is that they teach them to arrive with unerring certainty at the truth; and as everything in them depends on facts—real and sensible objects—they perceive at once the connection of cause and effect. Moreover, they gain the habit of searching minutely into a subject, not being content, as is too frequently the case in the study of abstract ideas, with mere words. The acquirement of true agricultural knowledge, then, must commence in the elementary or common district schools, taught by instructors who are familiar, to a considerable extent, with the operations of the farm, and educated at an agricultural normal school. Hence, to each of these seminaries there might be advantageously appended a parcel of ground, in which the young pupils could be employed at stated periods in the cultivation of trees, plants, and flowers, the rearing of silkworms, and in studying the habits of insects in general, injurious and beneficial, particularly those of the honey bee. In eight years, devoted to a school of this kind, say from the age of three to eleven, or from four to twelve years, under a proper instructor, a child could make considerable proficiency in at least three languages; would be enabled to read and write with tolerable correctness; could acquire a considerable knowledge in local geology, mineralogy, and botany, as well as the natural history of animals. He could also be taught within that time the rudiments of drawing, geometry, arithmetic, geography, history, astronomy, natural philosophy, music, gardening, pomology, and to perform various mechanical operations incident to a farm.

The question naturally arises how are all these things to be taught in so short a space of time? As the various modes of teaching are far more numerous than the subjects to be taught, no fixed rules can be laid down respecting them. In order to entitle any particular method, however, to a claim on our approval, we require that it should insure to the pupil, in the shortest time, the greatest progress, both in theory and practice. Like every other good instrument, it must work quickly and well. This should be the object of all teaching, for every age; but there is also another object which, though not so prominent, should never be overlooked—the means employed ought to favor as much as possible the development of all the faculties. In our estimation of the value of any method, time should always form an important element. It is not enough that progress is made; the pupil must himself be aware that he is advancing. As the time which can be bestowed on any particular study must always be limited, it is of great consequence that the merit of every method, in this respect, should be sufficiently ascertained to enable us to judge

of the probability of a pupil of moderate capacities reaping benefit from it.

By requiring a certain degree of progress, both in the theory and practice of any study, we insure the development of the faculties. If the pupil be only required to understand what is explained to him, the faculty of investigation remains dormant, and his mind may be unexercised, even while his attention is fully occupied. In order to excite him to real activity some subject of inquiry must be proposed. The truth of this is now almost universally acknowledged, and its application has been the subject of many experiments in education. From the time when Pestalozzi gave the first impulse to the inductive mode of teaching, it has been everywhere more or less practised. Desirous of making the pupil discover for himself the principles of every science, the teacher places the facts before him, and, as if ignorant himself of their bearing upon each other, asks him to compare and judge. If he make no observations, or only trifling ones, he is sensibly led into the right track by means of questions, or by questions and ellipses—sometimes a question and sometimes an ellipsis—or one or more of each, just as the subject demands, keeping in view the age and attainment of the child, until, at length, some lucky idea flashes upon his mind and at once discovers to him the principle of which he has been in search. The question sets the mind thinking—ellipsis draws out what has been set in motion—the union of the two, with analogy and illustration, forms "intellectual training." But as during this process the pupil has neither any idea of the conclusion at which he is expected to arrive, nor any distinct object in view, he is scarcely treated like a rational being, although the honor of the discovery may be flatteringly attributed to him. He does not understand why some of his remarks are praised and others rejected; and as he does not believe in the assumed ignorance of his teacher, he wonders why he is required to search so long for what it would have been more natural to tell him at once. It must be confessed, however, that the respective parts of the teacher and pupil seem better preserved by the contrary method, in which we begin by laying down the principles to be established; then, he who knows speaks, and he who is ignorant listens—asking such explanations as may be necessary.

But it does not appear that any of our prevalent systems of education are founded upon the principles of a distinct and systematic culture of the several intellectual faculties. It is true that considerable attention has been given to the very important distinction between an endeavor to impart a certain amount of knowledge on philosophic subjects and that more enlightened method, which, irrespective of a measure of attainment, actually made by the learner, aims to give to each of the powers of the mind a training and a habit, such as shall secure to the individual the highest possible future advantage in the employment of whatever endowments Nature may have conferred upon him; and yet, while the general principle has been adverted to, it has been but sparingly applied to the business of education, and scarcely at all followed out in reference to the mental powers sepa-

rately considered. Indeed, it is very true that the mere conveyance of those branches of knowledge which constitute a school course, in fact carries with it and implies a training of the faculties, and such a training as may be a sufficient preparation for entering upon the common engagements of life; but we have in view something more than this: First, the teacher should himself distinctly see the several ends he is to aim at in the general culture of the mind, to enable him to secure at last the energetic and well-balanced union of all parts of the mental machinery; and, secondly, in aiming at these ends, he should observe, as near as he can, the "order of Nature;" that is to say, he should not anticipate late-developed faculties in putting the mind wrong at the outset by doing first what should be done last, and last what should have been preliminary.

The power, whether active or passive, of entertaining ideas, apart from sensations and perceptions, which seems to be the first point of distinction marking the superiority of the human mind, may be called a "conceptive faculty." It gives the earliest indication of intellectuality in the infant, after the perceptions have become well defined. Long before any other properly mental operation can be detected, the infant gives proof that it has come into possession of images, which, without its bidding, take their turns in enlivening its otherwise vacant existence, and which, although as yet it has acquired no control over them, do not fail to obey the great laws that are to regulate all the mental operations of the adult. A thousand familiar facts give evidence of this faculty in the earliest months of life; and a singular and conclusive instance is afforded by an infant's recognition of the most imperfect representative symbol of a known object, and its ready connection of an idea of such an object with the name of it a few times repeated. The human mind in its first period, then, may be said to be all "ideality," for it is exclusively so during the half of its existence, or more, which is passed in sleep—chiefly so, whenever no vivid impressions are made upon the senses. The little attention which has been paid to this main characteristic of infancy and childhood has shown itself in the neglect of the many obvious means which offer themselves for giving direction and vividness to the faculty considered as the prime element of intellectual life.

Soon after the conceptive faculty has come into full activity, and, indeed, without any perceptible interval of time, the mind gives evidence, in a great variety of modes, that it has acquired a "sense" or "resemblance," and in a little time after a "sense of analogy" which, although in philosophical strictness they should be kept apart, may with convenience and in relation to practice be treated of in conjunction. Here, again, a wide field is opened to us, on which much may be effected by an intelligent and well-directed teacher; and it is precisely on this field that should be laid the broad and solid foundation, on which, at a remoter period, the active faculties may rear the superstructure of mental superiority.

A most important step is made in the business of education when we come in a formal manner to give exercise to the "power of abstraction," which is the chief prerogative of man, and the main

spring of his advancement in knowledge and civilization. It is this, in its higher degrees, that distinguishes one human mind so vastly from another, and is the primary reason of the achievement of the few who lead the way in science and the arts. To this point, then, the most exact and systematic attention must be given; for it is certain on the one hand, that any scheme of education which leaves the faculty of abstraction either uncultivated or accidentally developed, must be extremely faulty; and on the other, that, if a method of training consonant with the principles of the human mind be digested and ably put in practice, the intention of which shall be to give the highest possible advantage to this "first power" of the rational nature, everything else will be prosperous and easy.

The "reasoning faculty" in the order of Nature is developed late, and those who would have it expand under the most favorable auspices must direct their efforts, not to an endeavor to anticipate its proper season, but rather to the means of carrying the mind to a certain point of maturity before any serious exertion is required. Nevertheless, from a very early period, and especially after the time when the faculty of abstraction comes under culture, the teacher will keep in view what is to follow, and will watch for, and improve, any favorable opportunities, which may occur to give a little initiative play to the reasoning power, so far as Nature may appear to have developed it. This faculty is often observable in the infant at the age of six weeks, and gradually develops itself, although in a feeble degree, through the senses, each of which gives a motion different from the other, as is well known to all, that, in order satisfactorily to ascertain the qualities of substances or things, we habitually use all the senses; yet our senses are not sufficient to give us correct ideas of the world. For one person with excellent eyes may be far less observing than another possessing very poor ones, who has the faculty of perceiving resemblances, similitudes, and analogies in a higher degree; with another, tune may compare different notes; with a third, color contrast different shades; while with a fourth, comparison may distinguish a shade and a note, a form and a color, which the other faculties by themselves could not define. Again, we know that there are peculiar temperaments, which materially affect intellectual development; thus an individual having a lymphatic temperament is slow in thinking, and instruction must be adapted to this condition of mind. The nervous temperament, on the contrary, so common in this country, uniformly coëxists with activity of intellect; while the bilious temperament is most frequently accompanied by an excellent judgment, but a bad memory. Indeed, we often meet with individuals who are constantly reasoning, yet possess but little depth of understanding, whose powers are very active, yet accomplish nothing great; on the other hand, there are persons exhibiting very little mental activity, but who, when once engaged, produce grand results.

The "imaginative" sentiments and tastes, and the semi-moral emotions and habits of mind connected therewith, next claim to be considered, with several highly important mental features which bear upon the successful pursuits of active life. When the most

assiduous regard has been given to the training of the various faculties and sensibilities of the mind, there remains a not less important labor, though rather of an indefinite kind, the intention being to form and to confirm certain practical habits, upon the perfection of which the efficiency of the mind in relation either to common or to professional pursuits almost entirely depends. The general intellectuality which ought to be the fruit of a course, requires to be brought to bear in a definite manner upon the arduous labors of real life, whether commercial, professional, literary, or scientific. This might be called a "second education," whereby, after a youth has received his quantum of intellectual training, he shall be fitted to contend with specific difficulties, and to secure success in the particular business to which he may devote himself. After a young man's destination in life has been fixed, he should undergo a discipline aptly contrived, with the view to the critical points on which success is known to turn in that peculiar path of exertion. Whoever is conversant with active or scientific pursuits, or with the several professions, is aware of the fact, that among a number of competitors, it is not the man abstractedly the best qualified who ordinarily wins the prize; but he is successful who best knows how to deal with the "knots" of the business he undertakes. In every course of mental exertion, there is a certain portion, in disposing of which different minds are somewhat evenly measured one against another, but when all reach the "knot," it is perhaps one only who instantly "untwists" it, and by this means outstrips his associates. Now if there be something of natural tact in this sort of ready ability, there is also something which may be acquired, perfected by a proper discipline; and such a discipline may be laid down and exemplified in a practical manner, and could occupy a permanent place in a complete education.

But the most powerful incentive to mental development and a complete education, and perhaps that in which the world is the most deficient, is a knowledge of the true meaning and a full comprehension of the language employed in the subjects taught. A knowledge of the words relating to the visible appearances and sensible properties of the external world may be regarded as a repository of general facts cognizable by the human mind through the senses. And as no mind, however nice its perceptions, or exact and excursive its habits of observation, ever takes account of more than a small portion of the sensible qualities and shades of difference, which are actually perceived by man, a copious and refined language contains the recorded notices of thousands of minds, of all classes as well as of all degrees, or precision. Thus, for instance, if the most frequently used words, or epithets of a language, are taken as representing the broad perceptions of the mass of mankind, and as sufficient for all ordinary purposes of description and narration, there yet remain in reserve several sets of terms representing the more exact or inner perceptions, the faculties of which have been exercised and sharpened by peculiar pursuits, or by the habit of admitting intense sensations. One set of these comprises the descriptive words of poetry, which are expres-

sions of the highly refined perceptions of the most gifted and sensitive minds; and these very perceptions, unheeded by the generality of mankind, are brought through the medium of the terms employed, within the range of all—are, indeed, by their peculiar beauty and appropriateness, forced upon the common notice of all.

Again, there is another set of descriptive terms, or technical words, expressing those partial and yet very nice perceptions which result from the avocations and mechanical employments of different classes of men. These words, although they may not usually be available in writing or discourse, are worthy of attention when considered as records or notations of the sensible qualities of things. Let us take, for instance, a description of the sea and sky in a storm, which would be given by a landsman of ordinary sensibility, and possessing only an indifferent knowledge of language, that would well enough convey a general idea of the scene. Then let us ask the poet, whose eye has a peculiar regard for the beautiful and the sublime, and whose vocabulary contains a far more extensive assortment of terms to illustrate the same theme; and we shall find that he not only associates many fine sentiments with the natural objects before him, but that he has observed and noted many circumstances of the scene that had altogether escaped the common eye—in fact he has seen what the other saw not. But this is not enough; for we must next call in the painter—the marine painter—and if he possesses a moderate command of language—the technical language of his art—we immediately perceive that he, too, has noted a hundred nice shades and aspects of the scene, which not even the poet had found necessary to employ. Yet every such technical descriptive phrase marks a real circumstance of a stormy ocean and sky; and each is an incident which, after it has once been pointed out to us, we shall ourselves be able at another time to comprehend, and which we should regret not to have had in our power to observe.

We have not yet done, however, for if we go astern, and enter into a "talk" with the old mariner who holds the helm, and get him freely to employ his habitual terms in describing a gale of wind, we shall again be met, not merely by another set of words, but by a new class of observations, so peculiar as not to have been regarded either by the poet or the painter. One step more will lead us as far as we need go in this illustration: Let us then turn to the naturalist, who, having acquired those habits of exactness which are requisite in pursuing the particular methods of modern science, observes in the agitated sea and atmosphere many evanescent indications of the meteorological, chemical and electric changes that are occurring, and which had wholly escaped every eye but his own; and these more recondite phenomena he consigns to a technical phraseology peculiar to his profession. And now, if we take the entire compass of the language employed by the common observer, the poet, the marine painter, the old sailor, and the man of science, and expunge the few words which may be strictly synonymous, the copious collection will then constitute a vocabulary, corresponding with all the appearances which are cognizab'e by the human eye during a storm at sea. The set of

phrases employed by the first observer embraces only the most obtrusive features of the scene; those introduced by the second have the effect of extending and refining our conceptions on all sides; and thus in succession a third, a fourth, and a fifth pair of eyes is lent to us, and by the aid of each, and through the intervention of language, we are made mentally the spectators of the storm five times over, and until scarcely anything remains unimagined or unperceived.

Thus it is manifest that whoever, by the simple and easy means of collecting and making himself well acquainted with the signification of the entire vocabulary of descriptive terms, as severally employed by different classes of observers, not only enlarges his knowledge of language but conducts him to a condition whence every nice variety of the external world may be distinctly noted or vividly conceived. To learn the meaning of all descriptive terms, whether common, poetic, or scientific, is to furnish the mind with a cabinet of specimens containing whatever the most practised eyes have descried on the face of the material creation. Yet this is but a portion of the benefit accruing from an extended acquaintance with descriptive terms; for as we well know, words are at once our guides in expressing ourselves with regard to seeing, hearing, tasting, smelling, and touching or feeling with discrimination. They are the stimulants of perception and the indicators of the less obtrusive class of sensible facts. There are many appearances in Nature—there are innumerable varieties of figure, motion, color, texture, and sound, which would never arrest the eye or the ear, and of which we should take no cognizance had we not first attained a knowledge of the word noting the particular phenomenon, and thence be led to look for its archetype in Nature. An appropriate instance in illustration of this may be found in the set of phrases employed by medical practitioners for distinguishing the variations of the pulse, which shows how much the exactness of our perceptions depends upon the mental aid we receive from the use of distinctive terms. An unprofessional finger, however fine its sense of touch, does not usually discriminate more than four or five varieties of beat at the wrist; and one is content to say that the pulse is quick or slow, hard or soft, strong or weak. But the changes noted by the physician, and retained in his recollection by the use of distinctive epithets, amount to as many as two-and-twenty. For instance, the pulse is said to be frequent, slow, intermittent, equal, regular, or of varying force; or, it is full, long, laboring, bounding, feeble; hard, sharp, strong, wiry, weak, soft, yielding; quick, or tardy; or it is large or small. Now by the mere aid of this set of phrases fixed in the memory, an unprofessional hand might be trained, with a little practice, to feel and to distinguish all these variations. Hence it is by descriptive terms that we progress towards nicer and still more nice sensations, recalling with precision a large number of forms, shades, tints, kinds of movement, and modes of action.

Further to illustrate this subject, let us take other instances in which a pupil may be instructed in the useful practice of assembling and arranging descriptive words and phrases for himself. These exercises, which can readily be devised by the teacher, may be of

two kinds, the "concrete" and the "abstract." By the former is meant the adducing of epithets or actions in as great a number and variety as possible, which are attributable to any given subject, such as the ocean, a river, a waterfall, a sandy desert, an Alpine ridge, the forms, colors, functions, and uses of animals and plants, or the operations of machines, as exemplified below, in the properties of trees,—collectively and singly, thus—

A *forest* is said to be dense, dark, deep, entangled, pathless, gloomy, rich, magnificent, primeval.

Trees are—lofty, tall, low, bushy, ample, stately, umbrageous, wide-spreading, spiral-topped, round-headed, drooping, picturesque, gardenesque, sculpturesque, vigorous, decaying, shattered, leafless, scathed.

Foliage is—verdant, evergreen, sombre, variegated, dense, flaky, tufted, scaly, light, heavy, motionless, dancing, trembling.

The *branches* and *roots* are—gnarled, knotted, tortuous, slender, elastic, rigid, stooping, erect, fan-like, prone, supine, fibrous, interlaced, aspiring.

The *trunk* is—massive, slender, twisted, helix-like, rugged, riven, hollow, moss-covered, ivy-clad, crooked, straight, slanting, erect, fallen.

The *bark* is—rough, smooth, old, young, chapped, rigid, soft, interlaced, silvery, black, brown, green, grey, ashy, red.

The *leaf* is—thick, thin, polished, leathery, rough, indented, palmated, even, scolloped, hairy, woolly, downy, trembling, green, yellow, crimson, scarlet, brown, dark, light, bright, dull, translucent, opake.

To these might easily be added many other terms strictly botanical and technical, or common and poetical.

As another instance of enlarging the acquaintance of the student with language, and in order to impart to his conceptive faculty, richness, precision, and vivacity, let him describe the appearances incident to the sky and clouds—

The *sky by day* is spoken of as—serene, stormy, clear, overcast, misty, hazy, foggy, gloomy, lowering, bright, resplendent, brilliant, deep, dull, brazen, ruffled, red, roseate, grey, azure, vaulted, boundless, bounded; *at night* it is—blackened, sombre, dim, sparkling, spangled, starry, moonlit, magnificent.

Clouds are—thick, thin, heavy, light, dark, tender, fleecy, streaky, dappled, flaky, massive, dense, mural, stormy, rushing, flying, scudding, flitting, fantastic, motionless, broken, scattered, condensed, distinct, defined, commingled, confused, heaped, piled, towering, jagged, rounded, in tiers or strata, black, leaden, blue, green, red, pink, crimson, orange, firey, glowing, cold, purple, golden, silvery, fringed, feathery, buoyant, swollen, swelling, billowy, bulging, stooping, loaded, mantling, rainy, snowy, gathering, clearing, electric.

To these perhaps a hundred terms more, descriptive of ordinary overhead appearances, the poet would add, of an allusive or figurative kind; such as—gay, glad, melancholy, cheerful, ominous, portentous; and the painter not a few, of a peculiar sort, to fix in his recollection certain aspects of the heavens, or to indicate those appearances which demand attention when transferred to the canvas, such as—woolly,

muddy, dirty, chalky, muzzy, harsh, warm, cold, clean, raw, heavy; and the meteorologist would increase the list by the mention of cirrus, cumulus, stratus, and other scientific terms.

Again, to describe the acts of the steam-engine, it is said that—it propels, it rows, it sculls, it screws, it warps, it tows; it elevates, it lowers, it lifts; it pumps, it irrigates, it drains; it pulls, it draws, it pushes, it drives; it carries, it brings; it scatters, it condenses, it extracts, it collects; it splits, it breaks; it confines, it opens, it shuts; it shovels, it excavates, it digs, it ploughs; it threshes, it separates, it winnows, it fans; it washes, it crushes, it grinds, it sifts, it bolts; it mixes, it kneads; it moulds, it stamps; it punches, it rivets, it beats; it presses, it picks; it hews, it cuts, it carves, it slits, it shaves, it rives, it saws, it planes, it turns, it mortices; it bores, it drills, it heads; it forges, it blows; it rolls, it hammers; it rasps, it polishes; it files, it sweeps, it brushes; it scutches, it spins, it winds, it twists, it throws, it weaves; it shears; it coins; it prints; it kills.

After this manner, the skilful teacher could go on *ad infinitum*,, elucidating each subject as he proceeds, as far as practicable, by pointing out the sensations, appearances, sounds, and actions as they occur.

The Education of the Human Senses is full of interest, and would form an appropriate article for a future Report.

STATISTICS.

THE COLLECTION OF AGRICULTURAL STATISTICS.

An "actual enumeration" of the inhabitants of the United States and Territories is to be made in the year 1860, in such a manner as "Congress shall by law direct." The usage of the Government and the existing laws require that, in making this decennial enumeration, we shall take a census comprehending not only the names, ages, nativities, and occupations of the people, but estimates of their lands and estates; the products of their industry, with the values thereof; and other information in regard to their material and social condition. This duty is to be discharged by agents designated by the Secretary of the Interior; but the people, and especially those engaged in agriculture, will also have an important office to perform.

Through the labors of the Treasury Department, which takes cognizance of all imports and exports, we obtain information of great advantage to those who desire to comprehend the condition and prospects of the country; but this knowledge is comparatively of little worth without that which can alone be derived from an accurate census; and it is therefore the duty as well as the interest of every citizen to render a faithful and minute account of his affairs, and afford the

amplest facilities to the officers engaged in this service; and also to cause them to know that they are liable to be held to a strict responsibility by the Government and by the communities to which they respectively belong. To facilitate the discharge of these duties, the nature of the questions to be asked at the homes of farmers, planters, and others should previously be well understood, as they doubtless will be by all who shall give due attention to the "Interrogatories" embraced in this Report, which have been prepared with great care, and approved by the late Advisory Board of Agriculture of the Patent Office.

A distinction which should be well considered has in past times escaped the observation of many farmers and others, and led to erroneous conclusions. When the quantity or valuation of products is asked, reference is not made merely to what has been produced for sale, but to all that has been grown or manufactured, including that consumed by the producer himself. Thus, when it is desired to know how many tons of hay have been harvested from a certain farm, the question is not affected by the fact that the hay has been eaten by cattle belonging to its proprietor, any more than if the owner of an adjoining or other farm had purchased it to supply the animals in his stalls. Yet, as so rigid a mode of weighing and measuring may not be pursued where sale or barter is not contemplated, more judgment will necessarily be called for on the part of individuals in rendering returns; and it is to be hoped that it may be properly exercised, since, if an appreciation of this duty shall lead to the introduction into families and upon farms of a habit of noting the demands of domestic consumption, a salutary reform will thus have been incidentally effected.

Though it is generally understood that a knowledge of the commerce and material wealth of a country is important in connection with an estimate of its inhabitants, yet, in the midst of their exultation over the prosperity of our republic as evidenced in its rapidly increasing population, many of the American people appear to disregard the conclusions derived from the experience of nations which have outlived the prosperity of their youth. The opinion, indeed, prevailed among theorists, in former times, that an increase of population was always the most decisive mark of the prosperity of a State, and that it was the duty of every government to encourage early marriages, and to grant exemptions from certain public services and even bestow rewards on those having many children. But modern political economists agree that, however correct this assumption may be in relation to a new and sparsely peopled territory, it cannot long be practically observed with advantage, since it is the inevitable tendency of population everywhere to exceed the means of subsistence. A conviction of this tendency has induced the suggestion, by able and approved authors on this science, of means of restricting the natural increase; and the application of this policy to our own country, at a period not far distant, has been inferred from the ratio of our progress in the past. "It has been proved," says an intelligent writer on political economy, "that the population of some of

the States of North America has, after making the most ample deduction on account of immigrants, continued to double for a century past in so short a period as twenty, or, at most, twenty-five years; and there seems no reason to doubt, had supplies of food, and other articles necessary for the accommodation of man, been increased in a more rapid proportion, that the population would have kept pace with their progress." At this rate of increase, the area we possessed in 1850 would have contained in 1950, 368,000,000 inhabitants, or 40 per cent. more than the present population of Europe; and, in still another century, 5,888,000,000, or about five times the present estimated population of the globe.

A system of restriction is not only repugnant to the views of the people of the United States, and inapplicable to their present condition, but, by taking cognizance both of the prospective wants and the productive capacity of this country, and endeavoring to effect for the latter, if practicable, such improvements as shall secure an increase equal to the demands of the former, a work of great beneficence may be accomplished, gratifying alike to the philanthropist and the patriot. It is in the presentation of views of this character that the learned statist ascends in our esteem, and that, while the instruction he imparts appears to afford data of utility in the prosecution of the ordinary business affairs of life, it also opens a field worthy the investigation and enterprise of every liberal mind. The conviction that the products of the earth will never exceed the wants of man, but must always contribute to his happiness, ennobles the character of the employments of agriculture, and affords a powerful stimulus to the industry and inventive genius of those who pursue them; for, wherever there is conscious life there is happiness, and the increase of life and happiness is dependent upon the bounty of the earth.

But the assumptions herein cited, as admitted to be based upon the experience of nations, may justly be questioned in an era in which their boundaries are becoming comparatively faint, in which the whole earth and "the fulness thereof" are regarded by man as his inheritance, in which all the energies of the human mind and the lights of the unerring principles of Nature have become coöperators with the hand of industry, and in which the Divine command to labor is acknowledged as of universal application, and obeyed in the same spirit by the erudite student and the tiller of the soil.

While the general assent was accorded to these propositions with respect to the inadequacy of the earth to sustain the human family in its increase according to its own inherent laws, comparatively little of its surface was regarded as subject to culture, and that little had not been made to yield fruits according to its capability. But a revelation more in harmony with our just conceptions of the Divine law has dawned upon us—a revelation of the truth that the earth and man have been created for each other according to principles in which there can be no conflict—that it is not only sure that seed time and harvest shall not fail, but that the harvest shall forever be proportionate to the laborers who prepare and gather it.

It is in this cheering view of our country and of our race that the

connection between population and production assumes its most interesting aspect, and from this every American may learn to appreciate his relations as a citizen and the duties arising therefrom.

It may be further remarked that responses may be addressed to the Commissioner of Patents at Washington; that the language of the interrogatories need not be recited, reference to the numbers being sufficient; and that the questions presented relate not only to the past and present, but are applicable to the future, and call for the institution of a more exact system of observation and record than has been heretofore pursued.

INTERROGATORIES

To be filled out, as far as practicable, for the State, county, district, parish, hundred, town, plantation, or farm of ——— for the year ——.

CLASSIFICATION AND VALUATION OF LAND.

1. What is the area in acres of your State, county, district, parish, hundred, town, plantation, or farm?
2. What proportion consists of forests or woodlands?
3. What proportion is susceptible of tillage, excluding swamp lands and wastes?
4. What proportion is mountain lands or wastes incapable of improvement?
5. What proportion is swamp lands or marshes?
6. What proportion is prairie?
7. What proportion is lakes, ponds, or other waters, exclusive of boundaries?
8. What number of acres is in natural meadows?
9. What number of acres is employed for roads and railroads; and in what condition are these roads?
10. What number of acres is in natural meadows; and of these, what proportion is salt marshes?
11. What in low uncultivated grounds producing grass, other than salt marshes?
12. What number of acres is arable and in gardens?
13. What in artificial meadows?
14. What in pasture?
15. What in orchard and small fruits?
16. What in vineyards?
17. What number of acres is annually devoted to

    Wheat .... acres.
    Rye .... acres.
    Barley .... acres.
    Oats .... acres.
    Buckwheat .... acres.
    Rice .... acres.
    Indian corn .... acres.

Peas and beans .... acres.
Cow-peas .... acres.
Potatoes .... acres.
Turnips .... acres.
Carrots .... acres.
Beets .... acres.
Parsnips .... acres.
Yams .... acres.
Market gardening .... acres.
Rhubarb .... acres.
Cotton .... acres.
Hemp .... acres.
Flax .... acres.
Sugar-cane .... acres.
Sorghum canes .... acres.
Broom-corn .... acres.
Millet .... acres.
Tobacco .... acres.
Lucerne .... acres.
Madder .... acres.
Hops .... acres.

18. What crops not specified in the foregoing enumeration are raised, and what number of acres devoted to each?

19. What is the average price, per acre, of farms of 50 or more acres each, including buildings and other improvements?

20. What the greatest and average price of available woodlands, prairie or pasture lands?

21. How do the present prices of land range and compare with those of the last Census?

22. What is the increase of cultivated lands since, and what the average increase per annum?

23. How many acres have been bought and cultivated, per annum, by immigrants?

24. What are your best improved farms worth, per acre?

LEASES.

25. Is it customary with you to lease lands for life, for a term of years, on shares, or at will?

26. When on life lease, what sum of money, or share of the crops, is usually paid to the landlord?

27. How long are the leases usually when rented for a term of years?

28. What is the rent, per annum, per acre or 100 acres, with or without taxes, privileges, &c.?

29. In any of the above-named modes of leasing, are the tenants required to cultivate specified crops and to provide extraneous manures?

30. When farms are cultivated on shares, what proportion of the crops, or other recompense, goes to the tenant?

31. What moral or economical effects do any of these systems have on the sections where they are practised?

AGRICULTURAL LABOR.

32. In free labor, what is the greatest and average price paid to able-bodied men, per diem, week, month, or year, with or without board?

33. What wages are usually paid to house servants, per week or month, including board?

34. What is the greatest and average value of well-conditioned male slaves of the following ages—

Five to ten years?
Ten to fifteen years?
Fifteen to twenty years?
Twenty to twenty-five years?
Twenty-five to thirty years?
Thirty to thirty-five years?
Thirty-five to forty years?
Forty to forty-five years?
Forty-five to fifty years?
Fifty years and upwards?

35. What is the average value of well-conditioned female slaves of the same ages as above, namely,

Five to ten years?
Ten to fifteen years?
Fifteen to twenty years?
Twenty to twenty-five years?
Twenty-five to thirty years?
Thirty to thirty-five years?
Thirty-five to forty years?
Forty to forty-five years?
Forty-five to fifty years?
Fifty years and upwards?

36. What does it cost to sustain each or any of the above-named slaves, per annum, including food, medical attendance, and clothing?

37. What social, religious, or other privileges are generally allowed your slaves?

38. Are the lives of slaves usually insured, and if so, upon what principles or conditions?

39. Is there a scarcity of agricultural laborers at harvest time with you, and if so, to what cause do you attribute this scarcity, and what remedy can you propose?

40. Is it customary with you to exchange labor either by teams or otherwise, and if so, is it economical or in any way advantageous?

41. Are "corn-huskings," "corn-shuckings," or other "bees," as they are termed, economical or disadvantageous to the farmers, and if so, in what do their merits or demerits consist?

42. Can you state any other facts of interest concerning the man-

agement, domestic accommodation, and general welfare of agricultural laborers in your State?

IMPROVEMENT OF LAND.

DRAINAGE.

43. Has surface drainage by ditches or the ridge system of culture been practised with you, and if so, what methods have been pursued?

44. Has the "polder" system, (that is, drainage or shutting off by means of dikes a tract of land, the surface of which is lower than the waters adjacent to it, as practised in Holland,) been attempted with you, and if so, with what results, and by what methods is the water discharged, caused by leakage and springs, or precipitation from the clouds?

45. Has under-draining, either by tiles or other materials, been introduced, and if so, describe the particulars in reference to the dimensions of the drains, their distances apart, in different soils, depth below the surface, and cost per acre or lineal rod?

46. State the time when the first draining by tiles was introduced in your State.

47. With what advantages has the tile system been attended, in reference to early planting; security from freezing; clearing of weeds; effects of manure; early maturity; increased yield or improved quality of crops; drying of the surface of the ground in the spring or after rains; or the abandonment of open ditches and water furrows, often so obstructive to profitable culture?

48. Are drain tiles manufactured with you, and if not, from what distance are they transported, and at what cost obtained?

49. What is their cost per 1,000 lineal feet?

50. What number of acres are drained in your State, county, district, parish, hundred, town, plantation, or farm?

51. Are there any special companies for the execution of drainage, with you, or is it encouraged by agricultural societies, by the employment of draining engineers, or is it done at individual expense?

52. Can you state any other facts concerning the advantages and economy of land-drainage, that would tend to an increased production of your staple crops?

IRRIGATION.

53. Has irrigation or the formation of water meadows been practised to any extent with you, and if so, what plans have been adopted, and with what results?

54. What number of acres is artificially irrigated in your State, county, district, parish, hundred, town, plantation, or farm?

FERTILIZERS.

55. In what condition are your arable lands in respect to fertility, as compared with that of the time of their settlement?

56. To what do you attribute the cause of this deterioration or increased productiveness? .

57. What means do you employ for enriching your land, whether by irrigation, fish, the dung, urine, blood, or offal of other animals, artificial manures, sea-weed, or ploughing under green crops?

58. State in detail, the methods of making or procuring, as well as of applying the manures employed.

59. Describe the modes adopted for gathering and preparing stable and barnyard manures, composts, &c.

60. What are the average prices of each or any of these fertilizers, per ton, 100 bushels, cord, or load?

61. How often, in what manner, and in what quantity is each or any of these manures usually applied to a given space of ground?

62. Have you ever witnessed any injurious effects from a continued use of lime, plaster, guano, or other artificial fertilizer, on the same land?

63. By what means would you obviate the injurious effects, resulting from a continued use of these fertilizers?

64. Are any effects, produced by guano or any of the stimulating salts, when used as fertilizers, observed after the first crop, and if so, how long do such effects continue?

65. Have you ever known any benefits to accrue to the land or crops by "mulching" or otherwise inducing shade?

66. Have you observed any deterioration of the fertility of pasture lands, and if so, what methods have been employed for their improvement?

67. What other facts can you state in regard to the valuation or improvement of land?

ROTATION OF CROPS.

68. Has any system of rotation been established in your State, and if so, what is the order of the crops?

69. Have you adopted the system of mowing your grass lands one year and pasturing them the next, and if so, with what results?

70. Can you suggest a more judicious mode for a series of crops than is practised at present, that will prove more profitable to the producer, and leave the land in a good condition at the expiration of the term?

BREAD-CROPS.

WHEAT.

71. What has been the ratio of increase or decrease in the amount of wheat grown in your State since the last Census?

72. How many bushels have been used in either of the last two years for the purpose of distilling?

Winter Wheat.

73. What varieties of fall or winter wheat do you regard the most profitable to cultivate?

74. What is the character of the straw, heads, and grains; whether the ears bear awns, or beards; as to the length, erectness, or divergency; strength and color of the awns; color of the pellicles, or chaff, at maturity of grains; the periods of maturity of grains; degree of ripeness of straw at maturity of grains; greatest number of grains to an ear; and the number, quantity in measure and weight, of grains produced from a seed?

75. What time is wheat usually sown in autumn?

76. From your experience is there any advantage in sowing old wheat instead of new?

77. What quantity of seed do you apply to the acre when sown broadcast?

78. What quantity when dibbled or sown in drills?

79. What distance apart do you dibble or drill?

80. What are the comparative advantages of thick and thin sowing?

81. In adopting the last-named methods of sowing, will there be a sufficient increase in yield to justify the additional outlay for labor or machines?

82. What depth do you cover your wheat on light, sandy or loamy lands?

83. What depth in clayey or heavy lands?

84. Have you ever witnessed injurious effects, by disturbing the roots, or otherwise, from shallow covering on clayey lands from the upheaving of frost?

85. Are the wheat plants generally subject to winter-killing in your section?

86. At about what time in the season is wheat ready for reaping?

87. What is the greatest and average yield, per acre, in bushels?

88. Once in how many years do your wheat crops fall below an average?

89. How often have you experienced a total failure, and if so, to what do you attribute the cause?

90. What is the greatest and average weight of your wheat a bushel?

91. What number of bushels of fall wheat is required to make a barrel of flour?

92. What quantity of wheaten flour would you estimate is consumed by each person, man, woman, and child, per annum, in your State, in bushels or pounds?

93. What manures and in what quantities to the acre do you apply to wheat at the time of and previous to sowing?

94. What is the cost of cultivating wheat, per acre, including labor, wear of implements, seed, manure, interest and taxes on land, buildings, &c.?

95. What is the cost of transportation, per bushel, to the nearest inland or maritime market?

96. What are the net profits of an acre of an average crop of wheat?

97. What is the greatest and average value of wheat, per bushel, in your nearest market?

98. What is the greatest and average home value of flour, per barrel or 100 pounds?

99. What quantity of spirit or alcohol is produced from a bushel of wheat?

100. What is the value of this spirit per gallon?

Spring Wheat.

101. What varieties of spring wheat, if any, are the most profitable with you?

102. What is the character of the straw, heads, and grains?

103. What time are they usually sown?

104. At about what time in the season are they ready for reaping?

105. Do you deem it preferable and economical to cut wheat when the grain is in a soft or milky stage?

106. At what season is wheat usually threshed?

107. What disposition is made of the straw?

108. What price does it bring, per ton or 100 pounds, in your nearest market?

109. What is the greatest and average yield, per acre, in bushels?

110. What the greatest and average weight of the grain a bushel?

111. What number of bushels of spring wheat is required to make a barrel of flour?

112. Are any of the above-named varieties free from the attacks of graminivorous quadrupeds, birds, insects, smut, mildew, rust, or blight?

113. What varieties are most subject to any or each of their ravages?

114. By what insects is your wheat attacked in the green or unripe state?

115. What in a dry state, in the granary or stack?

116. From your knowledge of the habits of these insects, particularly the black wevil, (*Calandra granaria*,) and the Angoumois moth, (*Anacampsis cerealella*,) are you of the opinion that wheat containing them, their eggs, or larvæ, if sown, would germinate, or that they would engender in the ground or field?

117. Do you know of any preventives or remedies for devastations from quadrupeds, birds, insects, mildew, rust, and other diseases in wheat, and if so, what?

118. Have you ever fed off your wheat fields in winter or spring by sheep, with the view of preventing or diminishing the ravages of the joint-worm, wevil, or fly, and if so, with what results?

119. Have any attempts been made to hybridize wheat with a view of producing improved varieties, and if so, with what success?

120. Is it customary for the farmers with you to select the largest

and earliest ripened heads, with wide expanded awns, or beards, for seed?

121. Have you ever witnessed any effect on the period of maturity in employing seed brought from a warm to a colder climate, or from a cold one to a warmer, and if so, what?

122. What other facts can you state in reference to the improvement of quality, increase of yield, preservation, preparation, and transportation of wheat, and its manufactures?

BARLEY.

123. What has been the ratio of increase or decrease in the amount of barley grown in your State since the last Census?

124. How many bushels have been used in either of the last two years for the purpose of malting?

Winter Barley.

125. What varieties of fall or winter barley, if any, do you regard the most profitable to cultivate?

126. What quantity of barley flour would you estimate is consumed by each person, man, woman, and child, per annum, in your section, in bushels or pounds?

127. What is the character of the straw, heads, and grains; how many rows to a head; whether the ears bear awns or not; the length, erectness, divergency, strength, and color of the awns; color of the pellicles, or chaff, at maturity of grains; the periods of maturity of grains; degree of ripeness of straw at maturity of grains; greatest number of grains to an ear; and the number, quantity in measure and weight, of grain produced from a seed?

128. What time, in autumn or winter, is barley usually sown?

129. From your experience, is there any advantage in sowing old barley instead of new?

130. What quantity of seed do you apply to the acre when sown broadcast?

131. What quantity when dibbled or sown in drills?

132. What distances apart do you dibble or drill?

133. In adopting the last-named methods of sowing, will there be a sufficient increase in yield to justify the additional outlay for labor and machines?

134. What depth do you cover your barley on light, sandy or loamy soils?

135. What depth in clayey or heavy lands?

136. Are barley plants generally subject to winter-killing in your section?

137. At about what time in the season is fall barley ready for reaping?

138. What is the greatest and average yield, per acre, in bushels?

139. What the greatest and average weight of the grain a bushel?

140. What is the cost of cultivating barley, per acre, including labor, implements, seed, manure, interest and taxes on land, buildings, &c.?

141. What are the net profits of an acre of barley?

142. What is the greatest and average value, per bushel, in your nearest market?

Spring Barley.

143. What varieties of spring barley do you consider the best, either for malting or feeding to horses?

144. What is the character of their straw, heads, and grain?

145. What time are they usually sown?

146. What are the comparative advantages of thick and thin sowing?

147. At about what time are they ready for reaping?

148. What is the greatest and average yield, per acre, in bushels?

149. What the greatest and average weight of the grain a bushel?

150. What is its greatest and average value, per bushel, in your nearest market?

151. Is barley attacked by insects, mildew, or rust, with you?

152. What preventives or remedies have you, if any, against their ravages?

153. Have you ever witnessed any effects in employing barley for sowing brought from a warm to a colder climate, or from a cold one to a warmer, and if so, what?

154. Can you state any other facts in relation to the improvement in the quality of yield, preservation, preparation, or transportation of barle-?

RYE.

155. What has been the ratio of increase or decrease in the amount of rye grown in your State since the last Census?

156. How many bushels have been used in either of the last two years for distilling?

Winter Rye.

157. What varieties of fall or winter rye do you regard the most profitable to cultivate?

158. What is the character of the straw, heads and grains; the length, erectness, divergency, strength, and color of the awns; color of the pellicles, or chaff, at maturity of grains; the periods of maturity of grains; degree of ripeness of straw at maturity of grains; greatest number of grains to an ear; and the number, quantity in measure and weight, of grains produced from a seed?

159. What time in autumn or winter is rye usually sown?

160. From your experience is there any advantage in sowing old rye instead of new?

161. What quantity of seed do you apply to tne acre when sown broadcast?

162. What are the comparative advantages of thick and thin sowing?

163. What quantity when dibbled or sown in drills?

164. What distances apart do you dibble or drill?

165. In adopting the last-named methods of sowing, will there be a sufficient increase in yield to justify the additional outlay for labor and machines?

166. What depth do you cover your rye on light, sandy or loamy soils?

167. What depth in clayey or heavy lands?

168. Are rye plants generally subject to winter-killing in your section?

169. At about what time in the season is winter rye ready for reaping?

170. At what period is it usually threshed?

171. What disposition is made of the straw?

172. What is the straw worth per ton, or 100 pounds, in your nearest market?

173. What is the greatest and average yield of winter rye, per acre, in bushels?

174. What the greatest and average weight of the grain a bushel?

175. What per cent., by weight, does rye produce of bolted meal?

176. What quantity of rye meal would you estimate is consumed by each person, man, woman, and child, per annum, in your section, in bushels or pounds?

177. What is the cost of cultivating rye per acre, including labor, inplements, seed, manure, interest and taxes on land, buildings, &c.?

178. What are the net profits of an average acre of rye?

179. What is the greatest and average value, per bushel, of winter rye in your nearest market?

Spring Rye.

180. What varieties of spring rye do you consider the best for your section?

181. What is the character of their straw, heads, and grains

182. What time is this rye usually sown?

183. What are the comparative advantages of thick and thin sowing?

184. At about what time is spring rye ready for reaping?

185. What is the greatest and average yield per acre, in bushels?

186. What the greatest and average weight of the grain a bushel?

187. What per cent., by weight, does it produce of bolted meal?

188. What is the cost of cultivating rye, per acre, including labor, implements, seed, manure, interest and taxes on land, buildings, &c.?

189. What are the net profits of an acre?

190. What is the greatest and average value of spring rye meal, per bushel or 100 pounds?

191. Is rye of any kind attacked by insects, mildew, or rust with you?

192. What preventives or remedies have you, if any, against their ravages?

193. Have you ever fed off your rye fields in winter or spring by sheep, with the view of preventing or diminishing the ravages of insects, and if so, with what results?

194. Have you ever cut your rye previous to heading out, for the purpose of soiling, and if so, what effect had it on the yield of grain?

195. Has the feeding off by cattle or sheep, or thus cutting rye, apparently been detrimental to the yield of grain?

196. Have you ever witnessed any effects in employing rye for sowing brought from a warm to a colder climate, or from a cold one to a warmer, and if so, what?

197. Can you state any other facts in relation to the improvement in the quality, increase of yield, preservation, preparation, or transportation of rye?

OATS.

198. What has been the ratio of increase or decrease in the amount of oats grown in your State since the last Census?

Winter Oats.

199. What variety of winter oats do you regard the most profitable to cultivate?

200. What is the character of the straw, heads, and grains; color of the pellicles, or chaff, at maturity of grains; the periods of maturity of grains; degree of ripeness of straw at maturity of grains; greatest number of grains to a head; and the number, quantity in measure and weight, of grains produced from a seed?

201. What time are they usually sown?

202. What quantity of seed do you apply to the acre when sown broadcast?

203. What quantity when dibbled or sown in drills?

204. What distances apart do you dibble or drill?

205. In adopting the last-named methods of sowing, will there be a sufficient increase in yield to justify the additional outlay for labor and machines?

206. What depth do you cover oats on light, sandy or loamy soils?

207. What depth in clayey or heavy lands?

208. Are oat plants generally subject to winter-killing in your section?

209. At about what time in the season are winter oats ready for cutting?

210. At what period are they usually threshed?

211. What disposition is made of the straw?

212. What is the greatest and average value of the straw, per ton or 100 pounds, including the grain?

213. What is the greatest and average value, per ton or 100 pounds, of the straw after threshing?

214. What is the greatest and average yield, per acre, in bushels?

215. What is the greatest and average weight of the grain a bushel?

216. What is the greatest and average value, per bushel, of oats in your nearest market?

Spring Oats.

217. What varieties of spring oats do you consider the best for your section?

218. What is the character of their straw, heads, and grain?

219. What time in spring are they usually sown?

220. What are the comparative advantages of thick and thin sowing?

221. At what time are they ready for cutting?

222. What per cent. of the grain, by weight, is bolted oat meal?

223. What quantity of oat meal would you estimate is consumed in your section by each person, man, woman, and child, per annum, in bushels or pounds?

224. What is the greatest and average value of oat meal, per bushel or 100 pounds?

225. What is the greatest and average value of the grain, per bushel, in your nearest market?

226. What is the cost of cultivating oats, per acre, including labor, implements, seed, manure, interest and taxes on land, buildings, &c.?

227. What are the net profits of an acre of oats?

228. What is the greatest and average value, per ton or 100 pounds, of the straw after being threshed?

229. Are oats attacked by insects, mildew, or rust, with you?

230. Do you know of any preventives or remedies against their ravages?

231. Have you ever witnessed any effects in employing oats for sowing which have been brought from a warm to a colder climate, or from a cold one to a warmer, and if so, what?

232. Can you state any other facts in relation to the improvement in the quality, increase of yield, preservation, preparation, or transportation of oats?

BUCKWHEAT.

233. What has been the ratio of increase or decrease in the amount of buckwheat grown in your State since the last Census?

234. What variety of buckwheat do you regard the most profitable to cultivate?

235. What is the character of the grain in respect to its color and size?

236. At about what time is buckwheat sown?

237. What quantity of seed is required to the acre?

238. At what period is the crop ready for cutting?
239. At what season is it usually threshed?
240. What disposition is made of the straw?
241. What is it worth, per ton or 100 pounds, in your nearest market?
242. What is the greatest and average yield of grain, per acre, in bushels?
243. What the greatest and average weight of the grain a bushel?
244. What per cent. by weight does buckwheat produce of bolted flour?
245. What quantity of flour would you estimate is consumed in your section by each person, man, woman, and child, per annum, in bushels or pounds?
246. What is the cost of cultivating buckwheat, per acre, including labor, implements, seed, interest and taxes on land, buildings, &c.?
247. What are the net profits of an acre?
248. What is the greatest and average value, per bushel, in your nearest market?
249. What the greatest and average value of the flour, per 100 pounds?
250. Is buckwheat attacked by insects, mildew, or rust with you?
251. Do you know of any preventives or remedies against their ravages?
252. Have you ever witnessed any effects in employing buckwheat for sowing that has been brought from a warm to a colder climate, or from a cold one to a warmer, and if so, what?
253. Can you state any other facts in relation to the improvement in the quality, increase of yield, preservation, and preparation of buckwheat?

RICE.

254. What has been the ratio of increase or decrease in the amount of rice grown in your State since the last Census?
255. Is "Lowland" or "Upland" rice cultivated with you?

Lowland Rice.

256. What is the nature of the soil on which lowland rice best thrives?
257. What is the character of the water by which it is irrigated or overflowed—fresh, salt, or brackish?
258. How are the fields protected from floods or tides
259. If by levees, or dikes, what are their dimensions, and of what materials are they formed?
260. About what area, in acres, are the rice fields thus inclosed?
261. What is the greatest and average cost, per acre, in inclosing by dikes?
262. Is manure of any kind, other than water, applied to the fields?
263. In what manner is the ground prepared when ready for sowing?

264. At about what date do you sow?
265. When sown broadcast, what quantity of seed is applied to an acre?
266. When sown in trenches or drills, what quantity?
267. What distances are the trenches or drills apart?
268. In what manner are they opened?
269. What depth is the seed usually covered?
270. Do you consider it essential that the ground should be dry, and reduced to good tilth at the time of sowing, or may the seed be harrowed under when the soil is in a muddy or semi-fluid state?
271. By what rule are you governed in determining the proper stage of germination of the seed at the first withdrawal of the water from the field?
272. How long and by what sign, in examining the young plants after this withdrawal of the water, are the fields exposed to the sun and air before reflooding?
273. About how many days are sufficient for overflowing the fields at the second flooding?
274. After the withdrawal of the water the second time, at what height usually are the young plants, at the first cleaning or hoeing?
275. How long is it necessary to expose the field to the sun after thus cleaning, to kill the weeds, before letting on the water the third time?
276. To what height, or depth, is the water let on at the third flooding, and how many days is it allowed to remain?
277. By what rule are you governed in reference to the growth of the plants, to withdraw the water the third time?
278. Is it generally necessary to work or hoe the field after the third withdrawal?
279. How many days are the fields usually exposed to the sun and air between the third withdrawal of the water and the fourth time of letting it on?
280. How long may the water advantageously rest upon the field after the fourth flooding, and up to within what time of the period of harvesting the crop should it remain?
281. At about what date does the harvesting of rice usually commence?
282. By what signs do you know when the crop is ready for harvesting?
283. Until what state of dryness, and how long, is the rice suffered to lie in the field before it is bound into sheaves?
284. In what manner are the sheaves conveyed to the stack-yards?
285. Describe the most approved method of grading the stack-beds and constructing the ricks.
286. Of what shape and dimensions are the stacks of rice when formed?
287. At what period does the threshing commence?
288. What disposition is made of the rice straw?
289. How many bushels of rough rice are usually required to make a barrel of clean rice, weighing 600 pounds?

290. What quantity of rice would you estimate is consumed in your section by each person, man, woman, and child, per annum, in pounds?

291. What is the greatest and average value of rough rice, per barrel or bushel, in your nearest market?

292. What the greatest and average value of clean rice, per barrel or 100 pounds?

293. What is the value of broken rice, per barrel?

294. What is the greatest and average value of rice flour, per bushel or 100 pounds?

295. What per cent. of rough rice consists of pellicles, or hulls?

296. What per cent. is usually broken in cleaning?

297. What per cent. is reduced to flour?

298. Give an average of the respective products of rice, when cultivated to good advantage on your best fields, when ready for market—

Rough rice .... bushels.
Clean, merchantable rice .... pounds.
Broken rice .... barrels.
Rice flour .... bushels.

299. What is the greatest and average yield of rough rice, per acre, in bushels?

300. What its greatest and average weight a bushel?

301. What is the cost of cultivating an acre of rice, including labor, implements, seed, and interest and taxes on land?

302. What are the net profits of an acre of rice?

303. By what insects or diseases is lowland rice attacked, either in the field or in a dry state?

304. Do you know of any preventives or remedies for their devas tations?

Upland Rice.

305. In cultivating upland or "Mountain" rice, on what soil does it best thrive?

306. At what date is it usually sown?

307. What quantity of seed is required for an acre when sown broadcast?

308. What quantity when sown in drills?

309. What distance are the drills apart?

310. What depth is the seed covered?

311. At what periods, and how many times, is it hoed or worked, before harvesting?

312. At about what date is it ready for harvesting?

313. At what period is it threshed?

314. What is the greatest and average yield of rough rice, per acre?

315. What is its greatest and average weight a bushel?

316. What is the cost of cultivating an acre, including labor. implements, seed, manure, interest and taxes on land?

317. What are the net profits of an acre?

318. How do the quality and price of the grain, when prepared for market, compare with those of lowland rice?

319. By what insects and diseases is this variety attacked, either in the field or in a dry state?

320. What preventives have you, if any?

321. Have satisfactory experiments ever been made in planting lowland rice upon upland, or mountain rice upon lowland, and if so, what?

322. Can you state any other facts in reference to improvement of quality, increase of yield, preservation, preparation, and transportation of rice?

INDIAN CORN.

323. What has been the ratio of increase or decrease in the amount of Indian corn grown in your State since the last Census?

324. How many bushels are used, per annum, for purposes of distilling?

325. What varieties do you regard the most profitable to cultivate for feeding stock?

326. Describe the character of their stalks; the length, diameter, color, and number of rows to the ears; color and comparative size of the cobs, and number of grains to the ears; with the size, shape, starchiness or oiliness of the grains, and the earliness or lateness of maturity, and their liability to be injured by frosts.

327. What varieties are best for the manufacture of starch?

328. Describe them as above?

329. What varieties are best for "roasting-ears," or table use, when green?

330. Describe them?

331. What kinds are best for homony or bread-making?

332. What varieties best for distilling?

333. Is your corn land ploughed in autumn or spring?

334. What depth is it ploughed or subsoiled?

335. Do you generally employ oxen or horses for ploughing?

336. What quantity of land will a horse-team plough in a day?

337. What is the cost, per acre, including ploughman?

338. What quantity of land will an ox-team plough in a day?

339. What is the cost, per acre, including ploughman?

340. Which do you regard the most profitable, considering the increased amount of work performed by horses on the one hand and the value of oxen for beef, when withdrawn from labor, on the other?

341. When manure is added, is it applied before or after planting?

342. When applied before, in what manner and what quantity to an acre?

343. At about what date is corn usually planted with you?

344. What distances are the hills apart?

345. How many grains are dropped in a hill?

346. What quantity of seed-corn is required for planting an acre?

347. What depth is it covered?

348. In what solutions or preparations do you soak your seed-corn previous to planting?

349. What advantages do you derive from these preparations?

350. How many times do you hoe or work corn in the course of its growth?

351. Do you consider it essential to form hills, or to draw earth against the plants?

352. Do you think the cutting of roots of the corn, when working, diminishes the yield of grain?

353. What manures or fertilizers do you apply to the corn at the first or second working?

354. State the quantities and cost of each, and manner applied.

355. At about what date are the earliest varieties of corn ready for table use?

356. What is the greatest and average price of roasting-ears, per dozen, in your home markets?

357. Is your corn usually "topped," and if so, what disposition is made of the stalks?

358. Has the "topping" (removal of the portion of the stalks above the ears) any influence on the yield of grain?

359. At about what date are your general corn crops ready for harvesting?

360. What date the earliest variety?

361. When harvested is it cut and "shocked" in the fields, or are the ears immediately separated from the "husks," or "shucks," and stored in houses or barns?

362. If shocked, how long does the corn remain before it is husked or shucked?

363. What is the greatest and average yield, per acre, of shelled corn of the several varieties cultivated with you?

364. What quantity of ears is required of each to make a bushel, when shelled?

365. What will a bushel of shelled corn of each of the above varieties weigh?

366. What weight of ears of each is necessary to make a bushel of shelled corn?

367. How many pounds of starch are produced to a bushel of each or any of the above-named varieties?

368. What quantity of spirit or alcohol?

369. What quantity of oil?

370. What number of bushels are required to make a barrel of merchantable Indian meal?

371. What quantity of corn meal would you estimate is consumed in your section by each person, man, woman, and child, per annum, in bushels or pounds?

372. What is the cost of cultivating corn, per acre, including labor, implements, seed, manure, interest and taxes on land, buildings, &c.?

373. What the cost of transporting, per bushel or 100 pounds, to the nearest inland or maritime market?

374. What are the net profits of an acre of corn?

375. What is the greatest and average value, per bushel, at your nearest market?

376. What the greatest and average home value of Indian meal, per barrel or 100 pounds?

377. What is the value of corn starch, per pound or 100 pounds?

378. What is the value of spirit, or alcohol, per gallon?

379. What of corn oil, per gallon?

380. To what use is this oil applied?

381. What is the value of the residuum of the distilleries, or starch manufactories, per bushel or 100 pounds?

382. Are these materials employed with advantage in feeding animals of any kind?

383. By what insects and diseases is your corn attacked, either in a green or dry state?

384. What varieties, if any, are free from their ravages?

385. Do you know of any preventives or remedies for devastation from quadrupeds, birds, insects, fungi, or "smut," and other diseases incident to corn, and if so, what?

386. Is it customary with your farmers to select their seed-corn in the field by securing the best formed ears from the earliest and most productive plants?

387. When thus selected, in what manner are the ears dried?

388. What other modes of selecting seed-corn are practised?

389. What is the value of seed-corn, per bushel or 100 ears?

390. Have you ever witnessed any effects on the period of maturity, in employing seed-corn of any variety, brought from a warm to a colder climate, or from a cold one to a warmer?

391. What other facts can you state in reference to the improvement of quality, increase of yield, preservation, preparation, and transportation of Indian corn, or any of the manufactures therefrom?

COMMON OR PERUVIAN POTATOES.

392. What has been the ratio of increase or decrease in the amount of common potatoes grown in your State since the last Census?

393. How many bushels are used, per annum, for purposes of distilling?

394. What varieties are regarded best for general use?

395. Describe their characters in reference to the hue of the stalks of the vines; the color of the blossoms; the size and shape of the leaves; and the comparative size, form, color of the flesh, or pulp, of the tubers; the color, shallowness, deep-seatedness, and comparative number of their eyes.

396. What varieties are considered best for early use?

397. Describe their characters as above.

398. On what kind of soil do any of the above-named varieties produce the greatest yield?

399. On what soil is the edible quality of the potato best developed?

400. Is the land on which potatoes are cultivated usually ploughed in autumn or spring, and if so, which is preferable?

401. What depth is it ploughed or subsoiled?

402. Between what dates are potatoes generally planted?

403. What is your mode of producing early potatoes?

404. If manure is added, what kinds; when and how applied; and what quantities to the acre?

405. Are the tubers cut, or planted whole?

406. When cut, is the whole tuber employed, or only the seed-end?

407. Are they planted in hills or drills?

408. If by the former method, what distances are the hills apart?

409. If the latter, what distance are the drills apart?

410. If manured in the hills or drills, are the potatoes placed under or above the manure?

411. If planted in drills, how far are the tubers planted asunder?

412. To what depth are the potatoes covered?

413. In what manner, and how many times are they hoed, or worked, during their growth?

414. In the course of your experionce, have you ever noted any increase of vigor in the vines of the potato, or healthiness and productiveness in the crop, when produced from tubers grown farthest from the stalks, and whether such tubers have more deeply-seated eyes than those formed in the centre of the hill?

415. In dropping or adjusting the tubers in the hills or drills, is any attention paid in regard to the eye being placed towards the sun?

416. When thus planted, does it have any effect on the yield or healthiness of the crop?

417. Have you ever made the experiment of cultivating this crop under a bed of straw, without ploughing or working the ground, and if so, state particulars, with the result.

418. Does the potato plant blossom and produce balls, or apples, as abundantly of late years as formerly?

419. At what date are potatoes usually ready for digging with you?

420. By what methods are potatoes preserved with you in winter?

421. What is the highest temperature that they will bear without germinating or rotting?

422. What the lowest temperature without freezing?

423. Are they dug by machines or ordinary hoes?

424. In what manner are they preserved in spring?

425. What per cent. is usually lost, in winter, in storing, by rot and frost?

426. What is the greatest and average yield, per acre, in bushels?

427. What the cost of cultivating an acre, including labor, implements, manure, seed, interest and taxes on land?

428. What are the net profits of an acre?

429. When sold in autumn, what is the greatest and average price, per bushel, in your nearest market?

430. When disposed of in spring, what the greatest and average price?

431. What is the weight of a bushel of potatoes, Winchester measure, heaped?

432. If manufactured, what per cent., by weight, consists of starch?

433. If distilled, what amount of spirit is produced to 100 bushels?

434. What is the value of potato starch, per pound or 100 pounds?

435. What is the value of potato spirit, per gallon?

436. Have any new seedling varieties been produced in your section, and if so, what are they, their characteristics, and names?

437. Have you ever witnessed any effect in planting potatoes brought from a cold climate to a warmer one, or from a warm one to a colder, and if so, what?

438. Have any of the varieties of potatoes above named been subject to the attacks of insects or disease?

439. By what insects are they attacked?

440. Do you know of any preventives or remedies for their devastations?

441. By what diseases are they attacked?

442. As far as you can recollect, how many years since those diseases first appeared?

443. In the occurrence of the disease of the tuber, has the color of its skin appeared to be a predisposing cause?

444. Has the form of the tuber, the time of maturity, degeneracy, varieties recently produced from seed, the distance of the plants apart, the excess of moisture, the use of unfermented and ammoniacal manures, or the continued cultivation on the same ground, appeared to have any influence upon the health of this plant?

445. What other facts can you state in reference to the improvement of quality, increase of yield, preservation, and economical use of the common or Peruvian potato?

SWEET POTATOES.

446. What has been the ratio of increase or decrease in the amount of sweet potatoes raised in your State since the last Census?

447. Describe the varieties cultivated, in reference to their size, shape, color of skin and flesh, their edible qualities, and properties for keeping.

448. At about what date do you commence planting?

449. In what soil do they thrive best?

450. Are they planted in hills or drills?

451. If in hills, at what distances apart?

452. If in drills, at what distance apart, and how far are the tubers placed asunder?

453. Do you plant the entire tubers, or sets, or are they cut?

454. When planted entire, about what size are the sets?

455. How are the sets preserved during winter?

456. Is it necessary to start them in hot-beds, and afterwards remove them to the fields, or will your climate allow them to be planted out at once?

457. How many times in the season are they hoed or worked?

458. Do you find it necessary to manure this crop, either at the time of planting or in the course of its growth?

459. If manured, name the kinds of manure, cost and quantities to the acre, and mode of application.

460. At about what date is the crop ready for digging?

461. When kept for winter use, in what manner are the tubers preserved?

462. What per cent. is lost in storing, by rot or frost?

463. What is the cost of cultivating sweet potatoes, per acre, including labor, implements, seed, manure, interest and taxes on land?

364. What are the net profits of an acre?

465. What is the greatest and average yield of an acre, in pounds or bushels?

466. What is the greatest and average weight, per bushel?

467. What quantity of sweet potatoes, in bushels or pounds, would you estimate is consumed in your section by each person, man, woman, and child, per annum?

468. What is the greatest and average value, per bushel or 100 pounds, in autumn, in your nearest market?

469. What in the spring?

470. Are any varieties attacked by insects, or affected in any manner by disease?

471. If such ravages exist, what preventives or remedies have you, if any?

472. Have you ever witnessed any effect in planting tubers brought from a warm to a colder climate, or from a ccld one to a warmer, and if so, what?

473. Do any of the varieties of the sweet potato flower and perfect their seeds in your section?

474. Have any attempts ever been made, within your knowledge, to hybridize different varieties of the sweet potato with one another, or with other species of Convolvulus, with the view of obtaining a more hardy plant?

475. Can you state any other facts in relation to the propagation, culture, preservation, and economical uses of this crop?

CULINARY PLANTS.

476. What has been the ratio of increase or decrease in the amount of culinary vegetables, or market gardening, produced in your State since the last Census?

477. Have you any superior varieties of esculents particularly worthy of commendation, and if so, describe their peculiarities, modes of culture, if necessary, comparative productiveness, early or late maturity, properties for keeping, or any other advantage which they may possess?

FRUITS, NUTS, AND WINE.

APPLES.

478. What has been the ratio of increase or decrease in the amount of apples produced in your State since the last Census?

479. Designate the varieties of summer apples cultivated to the best advantage in your section, their order of preference, and dates of maturity; their properties for keeping; and the prices, per bushel, they bring in your nearest market.

480. Designate the best varieties of autumn apples, as above.

481. Designate the best varieties of winter apples, as above.

482. What do you regard as the best mode of preparing and packing apples for winter keeping, or shipping beyond sea?

483. What is the character of the soil, and its aspect with regard to the sun, of the best orchards in your section?

484. In what manner is the ground prepared for planting?

485. What number of standard trees, in the quincunx and in the square form, do you allot to an acre?

486. Of what dimensions do you dig the holes for planting?

487. With what do you fill these holes after digging, preparatory to planting the trees?

488. To within what distance of the surface do you usually fill them?

489. What depth do you plant the trees, as compared with that in which they grew in the nursery?

490. Have apple trees, with you, ever been cultivated by placing them entirely above the natural surface of the ground, and covering their roots with mounds of earth, instead of planting them in holes, and if so, with what result?

491. To what depth do the roots of full-grown apple trees ordinarily descend in the earth?

492. To what distance do they extend laterally from the trunk?

493. Would there be any advantage in confining the growth of the roots nearer to the surface?

494. How many supernumerary or dwarf trees, if any, do you allot to an acre?

495. What is the usual age and size of apple trees when planted?

496. What distance are the standard trees placed asunder?

497. Are grafted trees usually planted at first, or seedlings?

498. If the former, are they grafted at the root, or in the branches?

499. Which method do you regard the best, to plant seedlings and allow them to come into bearing, with the view of testing the fruit, and if not satisfactory, afterwards to graft them in the branches, or to graft the young stocks at the root, with the varieties of fruit desired?

500. What effect does grafting have on the longevity of the tree?

501. What is the greatest and average price of grafted trees, per 100, when ready for planting?

502. What of seedlings?

503. At what age do the grafted trees begin to bear?

504. At what age seedlings?

505. At what age do your orchards cease to bear, either seedlings or grafted trees?

506. What season do you regard a proper time for pruning?

507. Is it customary with you to train the branches of the trees horizontally and low, or to allow their heads to run into round or conical forms?

508. Which method do you regard the best?

509. If manures or composts are applied to orchards, name the kinds, quantities to the acre, periods of application, and cost of each?

510. Do any of these substances, when applied before midsummer, have any influence on the bearing of the trees the following year?

511. If trees, otherwise bearing only alternate years, thus treated, are made to produce every year, to what do you attribute the cause?

512. Does this bearing of every year have any influence on the longevity of the trees?

513. If the period of bearing is shortened by this treatment, would the increased yield of fruit compensate for the loss or deterioration of the trees?

514. Do you cultivate in your orchards hoed crops of any kind, and if so, what?

515. Which appear to be the least injurious to the trees, these crops or the grasses and Cereals?

516. Do you consider the ploughing of orchards injurious or beneficial, and if the former, in what does the injury consist?

517. Has under-draining by tiles, or otherwise, ever been applied to your orchards, and if so, with what results?

518. Has mulching around the trees ever been applied, and if so, with what effects?

519. After the trees are well grown—say at the age of twenty years—have you ever noticed any advantage in allowing the orchards to remain in grass and depasturing them by swine to about the period of the ripening of the fruit, and if so, what?

520. About what is the cost, per acre, of making an orchard twelve years old, including labor, implements, purchase of the trees, manure, interest and taxes on land, deducting the value of the fruit produced up to that age?

521. What are the net profits, per annum, of an acre of orchard containing 40 trees, from twelve to twenty years of age?

522. How many bushels of apples will such an orchard average to each tree?

523. How many bushels are required to make a barrel of cider of 30 gallons?

524. What is the greatest and average value of cider, per barrel, in your nearest market?

525. About what is the weight of a barrel of cider when fermented or "worked?"

526. How does the amount of cider vinegar, manufactured in your section, compare with that made since the last Census?

527. What is the greatest and average price of this class of vinegar in your nearest market?

528. What amount of cider brandy, if any, is distilled, per annum, in your section?

529. What per cent. of cider is converted into brandy in the process of distilling?

530. What is the greatest and average price of cider brandy, per gallon?

531. Are your orchards injuriously attacked by wild quadrupeds, birds, insects, or disease, and if so, what?

532. What preventives or remedies have you, if any, for their ravages?

533. What other facts can you give concerning the planting and management of orchards, the preservation and manufacture of their fruits, and the amount of their sales and profits?

PEARS.

534. What has been the ratio of increase or decrease in the amount of pears produced in your State since the last Census

535. Name the varieties of summer pears considered the best in your section, with the dates of maturity; qualities for keeping; and the prices, per dozen or bushel, they usually bring in your markets?

536. Name the best varieties of fall pears with their conditions as above?

537. Name the best winter varieties with the periods of gathering, the latest date they may be used, and the prices they bring, per bushel, in market?

538. What soil and aspect do you consider the most favorable to the productiveness and longevity of the pear?

539. Do you consider under-draining advantageous to this tree, irrespective of the wetness or dryness of the soil?

540. In what manner is the ground prepared for planting?

541. Of what dimensions do you dig the holes?

542. To within what distance of the surface do you usually fill the holes?

543. What depth do you plant the trees, as compared with that in which they grew in the nursery?

544. What number of standard trees, in the quincunx, and what in the square form, do you allot to an acre?

545. How many *quenouilles*, or dwarf trees?

546. What is the usual age and size of the trees when planted?

547. At what distance are the standard trees placed asunder?

548. On what other stocks than their own kind is the pear grafted with you?

549. Have any experiments ever been made to your knowledge of grafting the pear, reciprocally, or otherwise, on any species of Pyrus except its own, or on any species of Cydonia, Sorbus, Cratægus, Prunus, Amelanchier; that is, has it been engrafted upon the apple, or American wild crab, and *vice versâ*, the quince, mountain ash,

thorns of any kind, plum stocks, cultivated or wild, the June-berry, medlar, &c., and if so, with what results?

550. Have any attempts been made to engraft the pear into the roots of these trees, with the view of increasing their vigor or longevity, and if so, with what success?

551. To what depth do the roots of full-grown pear trees ordinarily descend in the earth?

552. What distance do they extend laterally from the trunks?

553. From your experience, do you think there would be any advantage in impeding the descent of the roots, by pruning or otherwise, and causing their growth to run parallel with the surface of the ground?

554. Have pear trees with you ever been cultivated by placing them entirely above the natural surface of the ground, and covering their roots with mounds of earth, instead of planting them in holes, and if so, with what results?

555. What is the greatest and average price of standard trees, per 100, when ready for planting?

556. What of dwarf trees?

557. At what age do they come into full bearing?

558. At what age do they cease to bear?

559. What is the average longevity of a pear tree?

560. What method of training or pruning do you regard the best?

561. If manures or composts are applied, name the kinds, quantities to the acre, periods and modes of application, and cost of each?

562. Do any of these substances, when applied before midsummer, have any influence on the bearing of the trees the following year?

563. Has mulching around the trees ever been adopted, and if so, with what effects?

564. About what is the cost, per acre, of making an orchard of standard trees ten years old, including labor, implements, purchase of the trees, manures, interest and taxes on land, deducting the value of the fruit produced up to that age?

565. What are the average profits, per annum, of an acre of such orchard, containing 108 trees, from ten to thirty years of age?

566. How many bushels of pears will such an orchard average to each tree, per annum?

567. About what is the cost, per acre, of making an orchard of dwarf trees five years old, including labor, implements, purchase of the trees, manure, interest and taxes on land, deducting the value of the fruit produced up to that age?

568. What are the average profits, per annum, of an acre of such orchard, containing 1,500 trees, from five to fifteen years of age?

569. What quantity of pears to each tree will such an orchard average, per annum?

570. Is perry made at present in your section?

571. When, if at all, did its manufacture cease?

572. What price does it bring, per barrel or dozen?

573. Are your pear trees injuriously attacked by birds, insects, or diseases, and if so, what?

574. What preventives or remedies have you, if any?

575. What other facts can you state concerning the planting and management of pear trees, and the improvement, preservation, and economy of their fruit?

QUINCES.

576. What has been the ratio of increase or decrease in the amount of quinces produced in your State since the last Census?

577. Designate the varieties cultivated to the best advantage; their order of preference and dates of maturity; properties for keeping; and the prices, per bushel, they bring in your nearest market.

578. By what methods are the trees usually propagated?

579. Designate the character of the soil; its aspect with regard to the sun; and the associated trees and plants with which the quince succeeds best.

580. Has under-draining been adopted in the culture of this tree, and if so, with what results?

581. In what manner is the ground prepared previous to planting?

582. Of what dimensions do you dig the holes?

583. With what are they filled preparatory to planting?

584. To within what distance of the surface do you usually fill them?

585. What depth do you plant the trees, as compared with that in which they grew in the nursery?

586. To what depth do the roots of full-grown trees ordinarily descend in the earth?

587. What distance do they extend laterally from the trunk?

588. What distance are the trees planted apart?

589. At what age do they come into bearing?

590. About what is the cost, per acre, of making an orchard ten or twelve years old, including labor, implements, purchase of the trees, manure, interest and taxes on land, deducting the value of the fruit produced up to that age?

591. What are the net profits, per annum, of an acre containing 435 trees, to ten years of age and upwards?

592. What quantity of quinces will such an orchard average, per annum, to each tree?

593. Is the quince with you injuriously attacked by wild quadrupeds, insects, or disease, and if so, what?

594. What preventives or remedies have you, if any, for their ravages?

595. What other facts can you give concerning the planting and management of this tree, the preservation and manufacture of its fruit, and the amount of the sales?

ALMONDS.

596. Is the almond cultivated to any extent in your State, with a view to profit, and if so, what?

597. Designate the best varieties in order of preference; dates of maturity; and the prices, per pound, they bring in your nearest market.

598. In the course of your experience with this fruit or nut, have you ever been led to discover any analogy between it and the peach, causing you to believe that the latter originated therefrom?

599. In what soil and aspect, with regard to the sun, does the almond best thrive with you?

600. Has under-draining been adopted in the culture of this tree, and if so, with what results?

601. By what method is it usually propagated with the object of producing nuts?

602. Within your knowledge, has the experiment ever been made of inoculating, or budding, it upon the stock of our plums, or any other species of Prunus, or upon the stocks of Pyrus, Sorbus, Cratægus, Amelanchier, or quince, and if so, with what results?

603. Is it ever cultivated from nuts by your nurserymen, as a stock upon which to inoculate the apricot or peach, and if so, what advantages have been derived therefrom?

604. To what depth do the roots of the almond penetrate in the earth?

605. What distance do they extend laterally from the trunk?

606. In the preparation of the ground for planting, of what dimensions do you dig the holes?

607. With what are they filled preparatory to planting?

608. To within what distance of the surface do you fill them?

609. What depth do you plant the trees, as compared with that in which they grew in the nursery?

610. What distance apart?

611. What is the usual cost of the trees, per 100?

612. At what age do they come into bearing?

613. What would be the cost of cultivating an acre at that age, including labor, implements, purchase of the trees, manure, interest and taxes on land?

614. At what age do they cease to bear?

615. What is the average quantity of nuts produced to a tree at the age of five years?

616. Once in how many years do you realize a full crop?

617. What are the profits of an acre of almond orchard, containing 108 trees, at five years of age?

618. What is the greatest and average value of the nuts, per pound or 100 pounds?

619. What is the quality of the nuts, as compared with those imported?

620. To what accidents is this tree liable, and by what insects or diseases is it attacked?

621. What preventives or remedies have you, if any, against their ravages?

622. Can you state any other facts concerning the planting and management of this tree, and if so, what?

PEACHES AND NECTARINES.

623. What has been the ratio of increase or decrease in the production of peaches in your State since the last Census?

624. What of nectarines?

625. Designate the best varieties of early peaches, with the order of preference; dates of maturity; properties for keeping; facility of transportation; and the prices, per bushel, they bring in your nearest market.

626. Designate the best varieties of late peaches, as above.

627. Designate the best varieties of nectarines.

628. From your experience, have you been led to believe that the nectarine originated from the peach, or more remotely from the almond?

629. By what methods are peach trees usually propagated in your section, as seedlings from pits or stones; by inoculation on stocks of their own species; or upon those of the almond or other allied kinds?

630. In what soil and aspect does the peach best thrive with you?

631. Has under-draining been adopted in the culture of this tree, and if so, with what results?

632. Have you ever made the experiment of germinating almond or peach stones in boxes of earth before sowing them, with their sharp ends pointing downwards, and pinching off the points of the radicles when an inch in length, with a view of preventing the growth of the tap-root, and causing them to throw out lateral rootlets, and if so, with what result?

633. To what depth do the roots of the peach tree penetrate in the earth at full growth?

634. To what distance do they extend laterally from the trunk?

635. Has the experiment ever been made with you of placing the peach tree on the surface of the hard ground and forming a mound of earth around and over the roots, and if so, with what results?

636. In the preparation of the ground for planting, of what dimensions do you dig the holes?

637. With what are they filled preparatory to planting?

638. To within what distance of the surface do you usually fill them?

639. What depth do you plant the trees, as compared with that at which they grew in the nursery?

640. What distance apart?

641. What is the cost of the trees, per 100?

642. What is the cost of cultivating an acre at the age of three years, including labor, implements, purchase of trees, manure, interest and taxes on land?

643. At what age does a peach orchard come into bearing?

644. At what age do inoculated trees usually cease bearing?

645. At what age seedlings?

646. What is the average quantity of peaches produced to a tree at the age of five years?

647. What are the profits of an acre of peach orchard, containing 108 trees at that age.

648. Can other crops be cultivated to advantage in these orchards, and if so, what?

649. To what accidents is this tree liable, and by what insects or diseases is it attacked?

650. What preventives or remedies have you against their ravages?

651. Can you state any other facts concerning the propagation, culture, and management of peach or nectarine trees, or the preservation or economical disposal of their fruits?

APRICOTS.

652. What has been the ratio of increase or decrease in the production of apricots in your State since the last Census?

653. Designate the best varieties, in order of preference; dates of maturity; and the prices, per dozen or bushel, they bring in your nearest market.

654. By what modes are they usually propagated, as seedlings from the stones, or by inoculation on stocks of the plum, or on those of other trees allied in character, and with what results?

655. In what soil and aspect with regard to the sun does the apricot best thrive?

656. Has under-draining been adopted in the culture of this tree, and if so, with what success?

657. Does the culture in other respects differ essentially from that of the nectarine and plum?

658. Has any attempt ever been made, within your knowledge, to hybridize the apricot with the peach or domestic-cultivated plum, and if so, with what results?

659. To what depth do the roots of the apricot penetrate in the earth at full growth?

660. To what distance do they extend laterally from the trunk?

661. In the preparation of the ground for planting, of what dimensions do you dig the holes?

662. With what are they filled preparatory to planting?

663. To within what distance of the surface do you usually fill them?

664. To what depth do you plant the trees as compared with that to which they grew in the nursery?

665. At what distance apart?

666. What is the cost of the trees per 100?

667. What is the cost of cultivating an acre at the age of three years, including labor, implements, purchase of manure, trees, interest and taxes on land?

668. At what age does an apricot orchard come into bearing?

669. At what age do inoculated trees usually cease bearing?

670. At what age seedlings?

671. What is the average quantity of apricots produced to a tree, at the age of ten years?

672. What are the profits of an acre of apricot orchard, containing 108 trees, at that age?

673. To what accidents is this tree liable, and by what insects or diseases is it attacked?

674. What preventives or remedies have you for their ravages?

675. Can you state any other facts concerning the propagation, culture, and management of the apricot trees, or the preservation or economical disposal of their fruits?

PLUMS.

676. What has been the ratio of increase or decrease in the production of plums in your State since the last Census?

677. Designate the best early varieties, in order of preference for table use; their dates of maturity; and the prices, per quart or bushel, they bring in the nearest market.

678. Designate the best late varieties as above.

679. Designate the best varieties, in order of preference, for drying and making prunes.

680. By what methods are plum trees usually propagated with you, as seedlings from the stones; by layers; or by inoculating upon plum stocks of the most free-growing varieties; or upon those of other species of Prunus?

681. In what soil and aspect in respect to the sun does the plum best thrive with you?

682. Has under-draining been adopted in the culture of this tree, and if so, with what results?

683. Have any attempts ever been made, within your knowledge, to hybridize the common domestic-cultivated plum (*Prunus domestica*) with the North American species, (*Prunus maritima*, *Prunus pubescens*, *Prunus chickasaw*,) or by fecundating its blossoms with the pollen of the almond, peach, apricot, or cherry, and if so, with what results?

684. To what depth do the roots of the plum tree penetrate in the earth when full grown?

685. To what distance do they extend laterally from the trunk?

686. In the preparation of the ground for planting, of what dimensions do you dig the holes?

687. With what are they filled preparatory to planting?

688. To within what distance of the surface do you usually fill them?

689. What depth do you plant the trees, as compared with that in which they grew in the nursery?

690. What distance apart?

691. What is the price of the trees, per 100?

692. At what age do they come into bearing?

693. What is the cost of cultivating an acre up to the age of five years, including labor, implements, manure, trees, interest and taxes on the land?

694. At what age does a plum orchard come into bearing?

695. At what age do inoculated trees usually cease bearing?

696. What is the average quantity of plums produced to a tree at the age of seven years?

697. What are the profits of an acre of plum orchard, containing 193 trees, at that age?

698. To what accidents is this tree liable, and by what insects or diseases is it attacked?

699. What preventives or remedies have you for their ravages?

700. Have prunes been successfully cultivated and prepared in your section, and if so, to what extent?

701. Detail the processes by which they are cured or dried?

702. What is the greatest and average price they bring, per pound or 100 pounds, in your market?

703. Can you state any additional facts in reference to the culture, preparation, and preservation of this fruit?

CHERRIES.

704. What has been the ratio of increase and decrease in the production of cherries in your State since the last Census?

705. Designate the best varieties of early cherries, with the order of their preference; dates of maturity; properties for keeping; facility of transportation; and the prices, per quart or bushel, they bring in your nearest market.

706. Designate the best varieties of late cherries, as above.

707. By what methods are cherry trees usually propagated in your section, as seedlings from stones; by inoculation on stocks of their own or other species of Cerasus, or those of other allied trees?

708. In rotting cherry stones in the heap, preparatory to sowing, have you ever succeeded in making those grow which had germinated during that process?

709. If not, to what do you attribute the failure?

710. In what soil and aspect, in respect to the sun, does the cherry tree best thrive with you?

711. To what depth do its roots penetrate in the earth?

712. To what distance do they extend laterally from the trunk?

713. When they extend to water, from your experience, what have been the effects?

714. In such situations, would under-draining by tiles, or otherwise, be attended with good results?

715. In the preparation of the ground for planting, of what dimensions do you dig the holes?

716. With what are they filled preparatory to planting?

717. To within what distance of the surface do you usually fill them?

718. What depth do you plant the trees, as compared with that in which they grew in the nursery?

719. What distance apart?

720. What is the cost of the trees, per 100?

721. At what age do they come into bearing?

722. What would be the cost of cultivating an acre at that age,

including labor, implements, purchase of trees, manure, interest and taxes on land?

723. At what age do they cease to bear?

724. What is the average quantity of fruit produced to a tree at the age of ten years?

725. What are the profits of an acre of cherry orchard containing 108 trees, at that age?

726. What is the greatest and average value of the fruit, per quart or bushel, in your nearest market?

727. To what accidents is this tree liable, and by what insects or diseases is it attacked?

728. What preventives or remedies have you for their ravages?

729. Can you state any other facts concerning the planting and management of this tree?

GRAPES AND WINE.

730. What has been the ratio of increase in the culture of the grape for table use in your State since the last Census?

731. What the ratio of increase in the amount of wine manufactured, as above?

732. Designate the best varieties of the grape for table use in open culture in the order of preference; dates of maturity; properties for keeping; facilities of transportation; and the prices, per pound or bushel, they bring in your nearest market.

733. Designate the best varieties of foreign grape for indoor culture, as above.

734. Designate the best varieties of grapes for the manufacture of wine.

735. By what methods are grape-vines usually propagated?

736. In the selection and preparation of cuttings for striking, from what part of the vine are they taken, in reference to the age of the wood; how many eyes are contained on each; and at what distance from the lowermost bud are they cut off at the time of planting?

737. Have you ever noticed that those cuttings in which two or three inches of wood have been left below the bottom bud are more liable to fail than those which have been cut off near that bud, and if so, to what cause do you attribute the failure?

738. Which do you prefer for striking the cuttings, a bed composed of brick-dust, silicious sand, peat earth, or a mixture of any of these materials?

739. To what depth and in what position do you insert the cuttings in the beds?

740. How often and at what period in the day do you water the cuttings during seasons without rain?

741. Are there many experiments at present in progress in your section in multiplying vines from seeds, and if so, with what prospects of success?

742. In how many years do seedling vines produce fruit?

743. In how many those produced from cuttings?

744. What do you estimate the longevity of American vines propagated from cuttings?

745. What that of seedlings?

746. Have any attempts been made in your section to hybridize the European vine with the American, or American vines with one another, and if so, with what results?

747. Has the European vine ever been inoculated or engrafted on any of the American species with you, and if so, what has been the effect?

748. Has this experiment been made in any other country, and if so, with what results?

749. What is the price of two-year-old rooted vines, per 100?

750. What soil and aspect in respect to the sun, is most favorable for a vineyard?

751. What season do you regard the best for planting?

752. Has the experiment ever been made with you of under-draining level or slightly undulating ground cultivated as a vineyard, and if so, with what results?

753. In preparing the soil for planting, of what dimensions do you dig the holes?

754. With what are they filled preparatory to planting?

755. To within what distance of the surface do you usually fill them?

756. What depth do you plant the vines, as compared with that in which they grew in the nursery?

757. What distances apart?

758. What is the cost of vines, per 100?

759. At what age do they begin to bear?

760. At what age do they usually come into full bearing?

761. As far as known, at what age do they cease to bear?

762. On what, and to what height, do you train the vines?

763. At what period of the year do you prune, and what method do you adopt in training?

764. By what birds, insects, or diseases is the vine attacked?

765. What preventives or remedies have you for their ravages?

766. What is the cost of making an acre of vineyard of the age of five years, including labor, implements, the procurement of the vine, trellises, manure, and interest and taxes on land?

767. How many acres of a well-grown vineyard can be managed by an able-bodied man, well provided with implements and team?

768. What quantity of grapes is produced to a vine at the age of ten years?

769. What are the net profits of an acre of vineyard, say 680 vines, at the above-named age?

770. What quantity of wine is made from a bushel of grapes?

771. How many gallons are produced to an acre of vines, when planted as above?

772. What is the greatest and average value of wine, per gallon, in your nearest market?

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773. At about what dates, with you, does the vintage season commence and end?

774. By what rules are you guided in picking, sorting, and ripening the grapes, preparatory to mashing?

775. By what processes are they mashed and pressed?

776. What use is made of the pomace, (marc,) or cheese, after the pressure has been well applied?

777. Describe the process of fermenting the "must," or grape juice, with or without sugar or grape brandy; the modes of removing the malic acid, and supplying the tartaric acid, if necessary; the size of the casks; the dimensions, temperature, and mode of ventilating the cellars and vaults; the age at which the fermented juice is racked off; the methods of fining, coloring, and preserving the aroma, flavor, or bouquet; and the bottling and storing of the wine.

778. Can you state any additional facts in regard to vineyards, the packing, preservation, and drying of grapes, and the manufacture of wine?

CURRANTS.

779. What has been the ratio of increase or decrease in the cultivation of currants in your State since the last Census?

780. Designate the best varieties of currants for drying and table use, with the order of preference; dates of maturity; properties for transportation; and the prices, per quart or bushel, they bring in your nearest market.

781. Designate the best varieties for making wine, as above.

782. What would be the cost of cultivating an acre at five years of age, including labor, implements, purchase of plants, manure, and interest and taxes on land, deducting the value of the fruit produced previous to that time?

783. What is the average quantity of fruit yielded by an acre, containing 5,445 plants, at the above-named age?

784. What are the profits of an acre, for table use, for wine, and for drying?

785. What amount of wine may be produced, by the usual mode of manufacture, from an acre?

786. What quantity of currants is required to make a gallon of wine?

787. What is the cost of making wine, per gallon, including sugar and other materials employed in its manufacture?

788. What is the most approved process of manufacture?

789. What is the value of the wine, per gallon?

790. By what insects or diseases is the currant attacked?

791. What remedies or preventives have you against their ravages?

792. What additional facts can you state in reference to the cultivation of the currant and its economical uses?

GOOSEBERRIES.

793. What has been the ratio of increase or decrease in the cultivation of gooseberries in your State since the last Census?

794. Designate the best varieties for table use, with the order of preference; dates of maturity; properties for keeping; facility of transportation; and the prices, per quart or bushel, they bring in your nearest market.

795. Designate the best varieties for making wine, as above.

796. What would be the cost of cultivating an acre at five years of age, including labor, implements, purchase of plants, manure, and interest and taxes on land, deducting the value of the fruit produced previous to that time?

797. What is the average quantity of fruit produced to an acre, containing 4,840 plants, at the age of five years, of each or any of the above-named varieties?

798. What are the profits of an acre for table use, and for wine?

799. What amount of gooseberry wine may be produced, by the usual mode of manufacture, from an acre?

800. What quantity of gooseberries are required to make a gallon of wine?

801. What is the cost of making the wine, per gallon, including sugar and other materials employed in its manufacture?

802. What is the most approved process of manufacture?

803. What is the value of the wine, per gallon?

804. By what insects or diseases is the gooseberry attacked?

805. What remedies or preventives have you against their ravages?

806. What additional facts can you state in reference to the cultivation of the gooseberry and its economical uses?

CRANBERRIES.

807. Are cranberries cultivated in your State, and if so, what has been the ratio of increase or decrease since the last Census?

808. How many acres of this fruit, either natural or cultivated, do you estimate your State to contain?

809. What is the character of the soil on which it best flourishes?

810. Has any experiment been made, within your knowledge, of cultivating this fruit on upland or other grounds, which are not overflowed with water, in winter or spring?

811. If overflowed or flooded, how long, and to what depth?

812. By what methods are they usually propagated?

813. Describe the manner of cultivating, whether propagated from seeds, off-sets, root-suckers, creeping roots, trailing-rooting stalks, or by improving natural cranberry meadows by irrigation or top-dressing with sand.

814. What is the cost of cultivating an acre of cranberries, either from seed, or by improving natural meadows, to a state of full bearing,

including labor, implements, purchase of plants, when required, and interest and taxes on land?

815. In how many years does a cranberry meadow come into full bearing, after sowing?

816. In how many after transplanting the suckers or roots?

817. What is the product of an acre, in bushels?

818. What is the greatest and average price of cranberries, per bushel, in your nearest market?

819. What are the net profits of an acre?

820. In what manner is this fruit put up for shipment?

821. To what accidents is the plant liable, and by what insects or diseases attacked?

822. What preventives or remedies have you for their ravages?

823. What additional facts can you give in regard to the cultivation, preservation, and transportation of this fruit?

STRAWBERRIES.

824. What has been the ratio of increase or decrease in the production of strawberries in your State since the last Census?

825. Designate the best early varieties, in regard to their order of preference; productiveness; sexes, whether staminate, pistillate, or hermaphrodite; properties for keeping; facility of transportation; and greatest and average price, per quart, in your nearest market.

826. Designate the best late and ever-bearing varieties, as above.

827. What is the character of the soil and its aspect in regard to the sun, in which this fruit best thrives?

828. Except in the production of seedlings, by what methods are strawberry plants usually multiplied or propagated?

829. In what manner is the soil prepared for planting?

830. What distances are hermaphrodite plants placed apart?

831. What distance staminate and pistillate plants, and what proportion of the former to the latter?

832. What do you regard as the best season for transplanting?

833. What culture do they require other than keeping the ground clear of grass and weeds?

834. Is frequent and long-continued watering, or irrigation, practised with this plant, and if so, with what advantages?

835. Is mulching adopted, and if so, with what results?

836. What season do you consider the best for loosening the ground around the roots?

837. Is the digging between the rows in autumn or winter, as is often practised by gardeners, attended with any injury to the plants, and if so, what?

838. What is the cost of cultivating an acre of strawberries, including labor, implements, purchase of plants, manure, materials for mulching, and interest and taxes on land?

839. How many years are required to bring a strawberry plantation into full bearing?

840. How often do the fields require replanting?

841. In the rotation of crops, between what products does the strawberry best succeed?
842. To what do you attribute these advantages?
843. What is the product of an acre at the age of full bearing?
844. What is the cost of picking strawberries, per quart?
845. What are the profits, per acre, of each variety, at the above-named age?
846. What of the late?
847. To what accidents is this plant liable, and by what insects or diseases attacked?
848. What preventives or remedies have you for their ravages?
849. What additional facts can you give in regard to the cultivation, transportation, preservation, or economical uses of this fruit?

RASPBERRIES.

850. What has been the ratio of increase or decrease in the production of raspberries in your State since the last Census?
851. Designate the best early varieties, in regard to their order of preference; productiveness; properties for keeping; facility of transportation; and the greatest and average price, per quart, they bring in your nearest market.
852. Designate the best late and ever-bearing varieties, as above.
853. What is the character of the soil and its aspect in regard to the sun, in which this fruit best thrives?
854. Except in the production of seedlings, by what methods are the plants usually multiplied or propagated?
855. In what manner is the soil prepared for planting?
856. What distances are the plants placed apart?
857. What do you regard as the best season for transplanting?
858. What culture do they require other than keeping the ground clear of grass and weeds?
859. Is mulching practised in the culture of this plant, and if so, with what results?
860. What season do you consider the best for loosening the ground around the roots?
861. What is the cost of cultivating an acre of raspberries, including labor, implements, purchase of plants, manure, and interest and taxes on land?
862. How many years are required to bring a raspberry plantation into full bearing?
863. How often do the fields require replanting?
864. In rotation of crops, between what products does the raspberry best succeed?
865. To what do you attribute these advantages?
866. What is the product of an acre at the age of full bearing?
867. What is the cost of picking the fruit, per quart?
868. To what accidents is this plant liable, and by what insects or diseases attacked?
869. What preventives or remedies have you for their ravages?

870. What additional facts can you give in regard to the cultivation, transportation, preservation, or economical uses of this fruit?

BLACKBERRIES.

871. Is the blackberry cultivated to any extent in your State, and if so, designate the best varieties, in order of preference; periods of maturity; properties for keeping; facility of transportation; and the greatest and average price, per quart or bushel, they bring in your nearest market?
872. What is the character of the soil and its aspect in regard to the sun, that appears to be best adapted to this plant?
873. By what method is it most readily propagated?
874. How do the properties of the seedlings compare with those of their originals?
875. In rotation, between what crops does the blackberry best succeed?
876. In what manner is the ground prepared for planting?
877. What distances are the plants placed apart?
878. What after-culture do they require?
879. In how many years do they come into bearing from seed?
880. In how many years from cuttings or roots?
881. Of what duration is a well-rooted plant?
882. What is the cost of cultivating an acre at the age of three years, including labor, implements, purchase of plants, manure, and interest and taxes on land?
883. What is the greatest and average quantity of fruit produced to a plant at the age of three years?
884. What are the net profits of an acre at that age?
885. What are the principal uses to which this fruit is applied?
886. If made into wine, how many gallons can be produced to an acre?
887. What quantity of this fruit is required to make a gallon of wine?
888. Describe the processes of manufacture.
889. What is the value of the wine, per gallon, in your nearest market?
890. By what insects or diseases is the blackberry attacked?
891. Have you any preventives or remedies for their ravages?
892. Can you state any additional facts concerning the culture and domestic uses of this fruit?

ORANGES.

893. What has been the ratio of increase or decrease in the production of oranges, in open culture, in your State since the last Census?
894. Designate the best varieties, in order of preference; periods of maturity; properties for keeping; facility of transportation; and

the greatest and average price, per 100, they bring in your nearest market.

895. By what methods are they usually propagated?

896. When engrafted or inoculated, upon what stocks do they best succeed?

897. When two buds are inserted in one stock, are they usually of the same or different varieties?

898. Is it customary to engraft or inoculate the branches, or insert at the root?

899. What season is this operation usually performed?

900. Wherein does spring budding differ from that of summer or autumn?

901. What is the character of the soil and its aspect in regard to the sun, in which the orange best thrives?

902. What is the preparation of the soil for planting?

903. Of what dimensions, and at what distance apart, do you dig the holes?

904. With what are they filled?

905. To within what distance of the surface are they filled before inserting the trees?

906. What depth are the trees planted, as compared with that of the nursery from which they were transferred?

907. To what depth do the roots extend in the earth when full grown?

908. How far do they extend laterally from the trunk?

909. Is mulching, or shading the trunk, in any way advantageous to the productiveness or vigor of this tree?

910. What after-treatment is necessary for a profitable growth?

911. In how many years does the orange come into bearing after planting from seed?

912. In how many from grafting or budding?

913. What is the greatest and average longevity of this tree?

914. What is the cost of making an acre of 108 trees of orange plantation, from inoculated or layered trees, to the age of ten years, including labor, implements, purchase of the trees, manure, and interest and taxes on land?

915. What, for making an acre of seedling trees at the age of twenty years?

916. What quantity of fruit is produced, per annum, by seedling trees at that age?

917. What quantity by an inoculated tree at ten years of age?

918. Is the fruit usually gathered in a green or fully ripened state?

919. When gathered in a green state, what influence does it have on the succeeding crop?

920. What are the net profits of an acre of inoculated trees at the age of ten years?

921. What, of an acre of seedlings at the age of twenty years?

922. In what manner are the oranges preserved and packed for shipment?

923. To what accidents is this tree liable?

924. By what insects and diseases is it attacked?

925. What preventives or remedies have you for their ravages?

926. Can you state any additional facts concerning the history, propagation, and management of the orange, or preservation and transportation of its fruit?

LEMONS AND LIMES.

927. Are lemons or limes cultivated, in open culture, to any extent in your State, and if so, with what success?

928. What facts can you state in reference to their propagation, management, yield, prices they bring in your nearest market, profits, &c.?

FIGS.

929. What has been the ratio of increase or decrease in the production of figs, in open culture, in your State since the last Census?

930. Designate the best varieties, in order of preference; their hardiness; periods of maturity; properties for keeping; facility of transportation; and the greatest and average price they bring, per 100, in number, pound, or bushel, in your nearest market.

931. What is the character of the soil, and its aspect in regard to the sun, in which this fruit best succeeds?

932. Have you observed any advantages in planting near the sea, and if so, what?

933. By what methods are figs usually propagated with you?

934. In what manner is the ground prepared for planting?

935. Of what dimensions, and at what distance apart, do you dig the holes?

936. With what are they filled?

937. To within what distance of the surface are they filled before inserting the plants?

938. To what depth do the roots extend in the earth, when full grown?

939. How far do they extend laterally from the trunk?

940. What depth are the trees planted, as compared with that of the sites from which they were transferred?

941. What subsequent management does this shrub require?

942. In your judgment, could under-drainage or irrigation be applied to its culture with advantage?

943. At what age, from cuttings or layers, do you allow the fig to ripen its fruit?

944. How many crops of ripened fruit can you gather in a year, and if more than one, is it produced on the old wood, or on that of the current year?

945. What is the cost of making an acre of fig trees at the age of seven years, including labor, implements, purchase of plants, manure, and interest and taxes on land?

946. What is the greatest and average quantity of figs produced by a tree at the above-named age?

947. What are the net profits, per annum, of an acre at that age?

948. Have any experiments been made with you in drying figs, and if so, by what process was the operation performed, and what the greatest and average value they brought, per pound, in your nearest market?

949. Has the experiment ever been made in the "caprification" of the fig, in your section, with the object of hastening the maturity of its fruit, and if so, with what results?

950. To what accidents is the fig liable with you?

951. By what insects or diseases is it attacked?

952. What preventives or remedies have you for their ravages?

953. Can you state any other facts relating to the history, propagation, and management of the fig, or the preservation, packing, and transportation of its fruit?

OLIVES.

954. Is the olive cultivated in your State to any extent, and if so, with what success?

955. Designate the best varieties, in order of preference; their hardiness; period of maturity; properties for keeping; facility of transportation; and the greatest and average price they bring, per quart, when pickled, in your nearest market.

956. What is the character of the soil and its aspect in regard to the sun, in which this tree best thrives?

957. Have you observed any advantages in planting it near the sea, and if so, what?

958. What methods do you regard the best for the propagation of this tree?

959. When grown from seeds, in what manner are they treated, at what season sown, what depth covered, and what time is required for them to vegetate, or come up?

960. What advantages do seedlings possess over trees propagated from cuttings?

961. Is the Italian mode of propagating practised with you, of planting what they call "uovoli," knots, or tumors, in the wood of the olive, caused by the sap not returning freely to the roots, but swelling through the bark of the trunk, and thus forming wens, or excrescences, containing embryo buds?

962. In what manner is the ground prepared for planting?

963. Of what dimensions and at what distances apart do you dig the holes?

964. With what are they filled?

965. To within what distance of the surface are they filled before inserting the trees?

966. To what depth do the roots extend in the earth, when full grown?

967. How far do they extend laterally from the trunk?

968. What depth are the trees planted, as compared with that of the sites from which they were transferred?

969. What subsequent management does this tree require?

970. In your judgment, could under-drainage or irrigation be applied to its culture with advantage?

971. At what age do seedling olive trees commence bearing fruit?

972. At what age when propagated from cuttings or knots?

973. What is the greatest and average longevity of olive trees, with you, as far as known?

974. What the cost of making an acre of 108 trees, propagated from cuttings or knots, at the age of ten years, including labor, implements, cost of plants, manure, and interest and taxes on land?

975. What the cost of an acre of seedling trees at the age of twenty years?

976. What is the greatest and average quantity of olives produced to a tree, propagated from cuttings or knots, at the age of ten years?

977. What the greatest and average quantity produced from seedling trees at the age of twenty years?

978. What are the net profits, per annum, of an acre of trees propagated from cuttings or knots, at the age of ten years?

979. What the profits of an acre of seedling trees at the age of twenty years?

980. Does the fruit fully mature in your section before the occurrence of hard frosts?

981. Have any attempts been made with you to make olive oil, and if so, by what processes, and with what success?

982. Are pickled olives made, and if so, by what processes are they prepared?

983. Have any attempts been made, within your knowledge, to engraft, inoculate, or hybridize the European olive with the American wild olive, (devil wood,) and if so, with what results?

984. To what accidents are olive trees liable with you?

985. By what insects or diseases are they attacked?

986. What preventives or remedies have you for their ravages?

987. Can you state any other facts in relation to the propagation, culture, and management of this tree, or in the preservation and manufacture of its fruit?

WALNUTS.

988. Is the Persian walnut, or Madeira nut, *(Juglans regia,)* cultivated in your State to any extent, and if so, with what success?

989. Designate the best varieties, in order of preference; their hardiness; periods of maturity; facility of transportation; and the greatest and average price they bring, per pound or bushel, in your nearest market.

990. What is the character of the soil and its aspect in regard to the sun, in which this tree best thrives?

991. In your judgment, could under-drainage or irrigation be advantageously applied in the cultivation of this tree?

992. What methods do you regard the best for its propagation?

993. When grown from nuts, at what season planted, what depth covered, and what time is required for them to vegetate, or come up?

994. On deep or moist soil, what modes do you adopt to prevent the downward growth of the tap-root?

995. In what manner is the ground prepared for planting?

996. If propagated and transplanted in pots, or otherwise, at what distance apart do you plant the trees?

997. To what depth do the roots extend in the ground when the tree is full grown?

998. How far do they extend laterally from the trunk?

999. What subsequent management does this tree require?

1000. At what age do seedling trees commence bearing?

1001. At what age those propagated by grafting or budding?

1002. What is the greatest and average longevity of this tree, so far as your knowledge extends?

1003. What is the cost of making an acre of engrafted or inoculated trees, at the age of ten years, including labor, implements, cost of plants, manure, and interest and taxes on land?

1004. What the cost of an acre of seedlings at the age of twenty years?

1005. What is the greatest and average quantity of walnuts produced by an inoculated or grafted tree at the age of ten years?

1006. What the greatest and average quantity by a seedling tree at the age of twenty years?

1007. What are the net profits, per annum, of an acre of inoculated or grafted trees at the age of ten years?

1008. What the profits of an acre of seedling trees at the age of twenty years?

1009. Has any experiment been made, within your knowledge, to engraft, inoculate, or hybridize the Madeira nut with the American butter-nut, black walnut, or any species of hickory, and if so, with what results?

1010. To what accidents is the Madeira nut liable with you?

1011. By what insects or diseases is it attacked?

1012. What preventives or remedies have you for their ravages?

1013. Can you state any additional facts in reference to the propagation, culture, and management of this tree, or concerning the preservation or economical uses of its fruit?

OTHER FRUITS AND NUTS.

1014. Are there any other fruits or nuts cultivated in your State, and if so, with what profit or success?

1015. What is the amount, in quantity or value, of the uncultivated nuts or fruits collected in your State, per annum, either consumed at home or sold in your markets?

FORAGE CROPS.

GRASS AND HAY.

1016. What has been the ratio of increase or decrease in the hay crop of your State since the last Census?

1017. What the increase or decrease in the production of grass seed?

1018. Designate the native or indigenous grasses cultivated with you, in order of preference; the soils in which they best flourish; quantity of seed sown, per acre, for mowing or pasturage; periods of sowing and harvesting; duration of their roots; the greatest and average yield of hay and seed, per acre, with the prices they bring in your nearest market.

1019. At what stage of growth are these grasses most advantageously cut, when intended for hay?

1020. At what stage when harvested for their seed?

1021. Do any of these grasses produce more than one crop of hay, per annum, and if so, what quantity, per acre, to each cutting?

1022. Describe your most approved methods of curing and storing hay.

1023. By what wild quadrupeds, insects, or diseases are any of these grasses injuriously attacked?

1024. What preventives or remedies have you, if any, for their ravages?

1025. Can you give any additional facts in reference to the cultivation, harvesting, preservation, or economical disposition of the grasses in your section?

PASTURAGE.

1026. What plants or grasses, whether native or foreign, spontaneous or cultivated, constitute the best pastures in your State?

1027. Which do you regard the best for the pasturage of horned cattle?

1028. Which for horses?

1029. Which for sheep?

1030. Which for swine?

1031. Can you state any additional facts in reference to their production, continuance, or economy in feeding?

SOILING PLANTS.

1032. Designate the plants employed in soiling in your State, with the dates of sowing and of coming into season; duration of their roots; the greatest, and average yield, per annum, when green, in tons, and the prices they bring when sold in a green state in your nearest market.

1033. By what wild animals or insects are any of these crops injuriously attacked?

1034. Have you any preventives or remedies for their ravages?

1035. What additional facts can you state in reference to the production, harvesting, and economical uses of soiling plants?

TURNIPS AND OTHER ROOTS.

1036. What has been the ratio of increase or decrease in the production of turnips in your State since the last Census?

1037. Designate the best varieties for stock, in order of preference; time of sowing; bushels and weight of roots and tops, per acre; qualities for keeping; adaptation for feeding; and the greatest and average price they bring, per ton or bushel, in your nearest market.

1038. Have you ever witnessed any advantages in the use of foreign over American turnip seed, or of new seed over old, and if so, to what do you impute the difference?

1039. In cultivating turnip seed with you, what does it cost, per acre, including labor, implements, value or purchase of the roots, manure, and interest and taxes on land?

1040. What is the greatest and average yield of seed, in pounds or bushels, per acre?

1041. What the greatest and average price it brings, per bushel or pound, in your nearest market?

1042. What other roots are cultivated as field crops with you, for feeding stock?

1043. Designate the general mode of culture of each; cost of production, and net profits, per acre, including labor, implements, purchase of seed, manure, interest and taxes on the land; the greatest and average yield, in weight or bushels, per acre; and the prices they bring in your nearest market.

1044. To what accidents are any of the above-named roots liable?

1045. By what insects or diseases are they attacked?

1046. What preventives or remedies have you for their ravages?

1047. What additional facts can you state in reference to the production of root crops, modes of harvesting, preservation, or economy in feeding?

TEXTILE AND OTHER STAPLE CROPS.

COTTON.

1048. What has been the ratio of increase or decrease in the amount of cotton produced in your State since the last Census?

1049. Designate the principal varieties cultivated with you, in order of preference; the form of their pericarps, (bolls,) whether square or round; the color, roughness, pubescence, arrangement, and adhesiveness of their seeds; the color, length, fineness, or irregularity of their staple, with the dates of the commencement and end of their periods of harvesting.

1050. What is the character of the soil and its aspect in regard to the sun, its altitude above sea level, and distance inland in which the Sea-Island variety best thrives?

1051. When cultivated remotely inland, on a similar class of soil as that you name, does it thrive as well or better than it does on an inferior soil lying in the vicinity of the sea?

1052. To what do you impute this difference?

1053. What is the character of the soil in which the upland or short-stapled cotton best thrives?

1054. In planting the seeds of these varieties in the best Sea-Island soil, is the quality of their fibre improved?

1055. Preparatory to planting, how many times, and at what depth, is the ground ploughed?

1056. Where manures or fertilizers are used, name the kinds and quantity to the acre of each, their cost, and modes of application?

1057. In preparing the ground for planting, in what manner is it "circled," or "barred off?"

1058. What depth is the seed usually planted, and what distances apart?

1059. What quantity of cotton seed do you apply to an acre?

1060. At the first working, by what processes are the plants thinned out, the grass extirpated, and the "dirting," or moulding, performed?

1061. In the after-culture, describe the regular order of the work, and the modes, means, and objects adopted in its performance?

1062. In gathering the cotton, do you deem it of importance to select bolls similar in quality, either in respect to the state of maturity, or uniformity of size?

1063. How many pounds of bolls, or squares, upon an average, will a hand pick in a day?

1064. In what manner is the cotton conveyed to the gin-yards, how dried, assorted, threshed, and ginned?

1065. After ginning, what disposition is made of the seed?

1066. When fed to animals, is it eaten raw or cooked?

1067. When cooked, how does it compare, in point of economy, with an equal measure of Indian corn?

1068. Has it ever proved injurious, either raw or cooked, when fed to animals?

1069. When given to cows, what effect does it have on their milk?

1070. Is oil manufactured in your State from the seed, and if so, what amount in bushels is thus consumed, per annum?

1071. How many gallons of oil are obtained from 100 bushels of seed?

1072. What per cent., by weight, of the seed is oil?

1073. To what uses is the oil applied?

1074. What is the value, per gallon, in its crude state?

1075. What when refined?

1076. What disposition is made of the oil-cake?

1077. When fed to animals, how does it compare, in point of economy, with equal weights of corn or Indian meal?

1078. When employed as a manure, how does it compare, in point of economy, with Peruvian guano, or farmyard dung?

1079. What is its greatest and average price, per 100 pounds or ton?

1080. What is the greatest and average value of cotton seed, per bushel, in its crude or unmanufactured state. in your nearest market?

1081. What is the cost of cultivating an acre of cotton, including labor, implements, purchase of seed, manure, interest and taxes on land, buildings, &c.?

1082. What is the greatest and average number of acres cultivated with you to a hand?

1083. What the greatest and average yield of staple, per acre, in pounds or bales?

1084. How many pounds of cotton do you estimate are consumed, per annum, in clothing and other domestic uses by each person in your section?

1085. What amount is annually consumed, not estimated in sales, on the cotton plantations?

1086. What is the greatest and average yield of cotton seed, per acre, in bushels?

1087. What is the greatest and average weight of the seed, per bushel?

1088. What are the net profits of an acre?

1089. What is the greatest and average price of long-stapled or Sea-Island cotton, per pound, at your principal ports of shipment?

1090. What of short-stapled?

1091. What of Nankin or yellow cottons?

1092. What is the cost of transportation, per bale, of 400 pounds, from the central part of your State to the nearest inland or maritime markets?

1093. Is the staple, or fibre, of a well-matured boll of uniform or approximate length, before separation from the seed by the gin, or is it unequal?

1094. In ginning, what is the per-centage of loss in the weight of rough cotton, caused by the separation of leaves, trash, motes, grass, dust, grit, or sand?

1095. Has the general condition of the cotton staple, in your section, as to length, strength, or yield, improved or deteriorated within the last thirty years?

1096. In cultivating the Nankin or colored cottons, are they not liable to hybridize or injuriously mix with the other varieties, when planted in neighboring or contiguous fields?

1097. In cultivating a white-stapled variety in a field planted the year previous with Nankin cotton, have you ever observed any variation in the color of its fibre, and if so, to what cause do you attribute this change?

1098. To what accidents is the cotton plant liable?

1099. By what insects or diseases is it attacked?

1100. What remedies or preventives have you for their ravages?

1101. In rotation, between what crops will cotton most advantageously thrive?

1102. When planted on the same field many years in succession, is rust, or blight, more prevalent than when cultivated with alternate crops?

1103. To what cause might this difference be attributed, as connected with the physiology of plants?

1104. What additional facts can you state in reference to the origin, history, production, harvesting, preparation for market, transportation, and economical uses of cotton?

HEMP.

1105. What has been the ratio of increase or decrease in the amount of hemp produced in your State since the last Census?

1106. What is the character of the soil in which it best thrives, and in what manner is the ground prepared for sowing?

1107. If manures are used, name the quantity and cost, per acre, duration of their effects, and the manner in which they are applied.

1108. At what season do you usually sow?

1109. Is it sown broadcast or in drills?

1110. If in drills, at what distances apart, and what quantity to an acre?

1111. If broadcast, what quantity of seed is allotted to an acre?

1112. What after-culture does this plant require, if any, previous to gathering?

1113. Is this crop usually grown entirely for fibre, or with a view of obtaining both fibre and seed?

1114. When the crop is grown only for its fibre, at what stage of growth is it pulled?

1115. In this operation, is any distinction made between the male and female plants?

1116. When grown both for fibre and seed, is it customary to pull the male plants as soon as their flowers have effected their purpose of fecundating the female?

1117. What disposition is made of these plants, if thus pulled?

1118. What time is usually required to mature the seed after fecundation?

1119. In finally securing the female plants at maturity, are they pulled out by the roots or cut off near the ground?

1120. What is the cost of cultivating an acre of hemp, including labor, implements, purchase of seed, manure, interest and taxes on land, buildings, &c.?

1121. What is the greatest and average quantity, in pounds or tons, of dressed fibre produced to an acre?

1122. By what processes is it rotted?

1123. Which do you regard the best?

1124. In what manner is the hemp stored previous to braking?

1125. What is the greatest and average value, per pound or ton, of the dressed fibre, in your nearest market?

1126. What is the greatest and average quantity of hemp seed produced to the acre?

1127. What the greatest and average weight of the seed, per bushel or pounds?

1128. What is the greatest and average value, per bushel, in your nearest market?

1129. What are the net profits of the entire crop, per acre?

1130. How does hemp, as an exhauster of the soil, compare with other crops?

1131. Is this plant usually cultivated several years in succession on the same land, or is it alternated with other crops?

1132. When attention is paid to rotation, between what plants can it be cultivated to the best advantage?

1133. By what wild quadrupeds, birds, insects, or diseases is this plant attacked?

1134. What preventives or remedies have you for their ravages?

1135. What additional facts can you state with regard to the production, harvesting, and preparation for market of hemp or its seed, and its application to any economical use.

FLAX.

1136 What has been the ratio of increase or decrease in the amount of flax produced in your State since the last Census?

1137. What the ratio of flaxseed, as above?

1138. What is the character of the soil, and its aspect in regard to the sun, in which this plant best thrives?

1139. In what manner is the ground prepared for sowing?

1140. If manures are used, name the kinds, quantity allotted to an acre, their cost, the manner in which they are applied, and the duration of their effects.

1141. At what season do you usually sow?

1142. Do you use American or imported seed?

1143. What quantity of seed is applied to an acre?

1144. Is it customary with you to roll the ground after harrowing in the seed?

1145. What culture does this plant require, if any, previous to pulling?

1146. Is this crop usually grown entirely for its lint, or with a view of obtaining both lint and seed?

1147. When cultivated for lint only, is regard paid to thick sowing, with a view of producing long stalks and fine filaments?

1148. When grown for this purpose, at what stage of growth is it pulled?

1149. When cultivated both for its lint and seed, do you adopt the system of thin sowing, with a view of giving a greater lateral development of the plants, and consequently a greater yield of seed?

1150. Which of the above-named methods is considered the most lucrative?

1151. What is the cost of cultivating an acre of flax, including

labor, implements, the purchase of seed, manure, interest and taxes on land, buildings, &c.?

1152. Is it dew-rotted or water-rotted?

1153. Which do you regard the best?

1154. What is the greatest and average quantity, in pounds or tons, of dressed lint produced to the acre?

1155. In what manner is the flax stored previous to braking?

1156. What is the greatest and average value, per pound or ton, in your nearest market?

1157. What is the greatest and average quantity of flaxseed produced to the acre?

1158. What the greatest and average weight of the seed, per bushel, in pounds?

1159. What is its greatest and average value, per bushel, in your nearest market?

1160. What are the net profits of the flax crop, per acre?

1161. When the seed is manufactured into oil, how many gallons are produced, per 100 bushels?

1162. What per cent. of the seed, by weight, is oil?

1163. What is the greatest and average price of linseed oil, per gallon, in your nearest market?

1164. What disposition is made of linseed oil-cake?

1165. When fed to cows, what effects does it have on their milk?

1166. When thus fed, what is its value in point of economy, compared with an equal weight of Indian meal?

1167. When used as a fertilizer, how does it compare, economically, with an equal weight of Peruvian guano, or a corresponding amount of farmyard dung?

1168. How does flax, as an exhauster of the soil, compare with other crops?

1169. Is it usually cultivated several years in succession on the same land, or is it alternated with other plants?

1170. When attention is paid to rotation, with what crops can it be cultivated to the best advantage?

1171. By what wild quadrupeds, birds, insects, or diseases is this plant attacked?

1172. What preventives or remedies have you for their ravages?

1173. What additional facts can you state in regard to the production, harvesting, and preparation for market of this plant or its seed, and its application to economical use?

MADDER.

1174. Is madder cultivated to any extent in your State, and if so, what has been its increase or decrease since the last Census?

1175. Designate the character of the soil and its aspect in regard to the sun, in which this plant best thrives; the manner the ground is prepared; the period of sowing or planting; the distance of the plants apart; the culture during the first, second and third years; the season and mode of digging, harvesting, washing, drying, and

grinding the roots; and the yield and profit of the dried roots, per acre, with the greatest and average price they bring, per pound or ton, in your nearest market?

TOBACCO.

1176. What has been the ratio of increase or decrease in the amount of tobacco cultivated in your State since the last Census?

1177. How many pounds of tobacco are consumed, per annum, on an average, by each of the male inhabitants, irrespective of age and color?

1178. Designate the best varieties of tobacco cultivated with you in the order of preference; the character, dimensions, and usual number of leaves to a plant; the yield, per acre, in pounds; and the uses to which they are applied, with the greatest and average price, per pound, they bring in your nearest market.

1179. During what period do you sow the seed?

1180. In selecting a site for a seed-bed, describe the character of the soil; its aspect in regard to the sun; its protection against winds; and the manner in which it is prepared for sowing.

1181. When sown broadcast, what quantity of seed do you allow to a square rod; what depth is it covered; and what length of time is required for it to vegetate?

1182. What precautions do you take against accidents by drought or frost?

1183. When propagated for sale, what price do the plants usually bring, per 1,000?

1184. Has the experiment ever been made of propagating the plants in a warm region, and transporting them by water or otherwise to a colder one, and if so, with what results?

1185. Of what size are the young plants when most suitable for removing to the field?

1186. What is the character of the soil and its aspect in regard to the sun, in which the tobacco plant best thrives?

1187. In what manner is the ground prepared for planting?

1188. If manures are used, name the kinds, quantities allotted to an acre, their cost, the manner in which they are applied, and the duration of their effects.

1189. During what period do you transplant?

1190. How many plants do you allot to an acre, and at what distance apart?

1191. What culture does this crop require previous to the period of topping?

1192. Describe the periods and modes adopted in "priming," "topping," suckering," and "worming."

1193. About how long after planting is tobacco ready for cutting?

1194. By what indications is it known when the plants are sufficiently matured for cutting?

1195. What length of time are they exposed to the sun after cutting, in order to "fall," or wilt?

1196. In storing tobacco in barns, how many plants are allowed to a stick?

1197. In curing, do you consider it important to get rid of the condensed vapor from the green leaves as quickly as possible, or to require a longer time?

1198. Is it customary with you to dry the tobacco by passing rapidly through it currents of artificially heated air, or to perform the operation by the natural radiation of heat?

1199. When artificial heat is employed, to what temperature is it exposed, how far are the sticks placed apart, and what length of time is required to bring it to a sufficiently dry state?

1200. By what indications is it known when the tobacco is sufficiently dried?

1201. When dried by natural heat, to what temperature is it usually exposed, how far are the sticks placed apart, and what length of time is required to bring it to a sufficiently dry state?

1202. Have any experiments ever been made, to your knowledge, in employing sulphurous vapor, lime, or other absorbents of moisture, in the curing of this crop, and if so, with what results?

1203. In what time after housing are the leaves usually stripped from the stalks?

1204. Describe the manner of sorting, packing, bundling, prizing, and other modes of preparing them for market.

1205. What is the cost of cultivating an acre of tobacco, including labor, implements, purchase of seed, or plants, manure, interest and taxes on land, buildings, &c.?

1206. What is the greatest and average quantity, in pounds, of the leaf produced to the acre?

1207. What are the net profits of the crop, per acre?

1208. In the cultivation of this plant for its seed, what precautions are used, and what the after-treatment?

1209. What is the greatest and average yield of seed to the acre, in bushels or pounds?

1210. What is the weight of a bushel of tobacco seed, in pounds?

1211. What is its greatest and average price, per pound, in your nearest market?

1212. What disposition is made of your tobacco stalks?

1213. How do they compare, economically, with an equal weight of Peruvian guano, or a corresponding amount of farmyard dung?

1214. How does tobacco, as an exhauster of the soil, compare with other crops?

1215. Is it usually cultivated several years in succession on the same land, or is it alternated with other plants?

1216. When attention is paid to rotation, with what crops can it be cultivated to the best advantage?

1217. To what accidents is this plant liable?

1218. By what insects or diseases is it attacked?

1219. What preventives or remedies have you for their ravages?

1220. What additional facts can you state in regard to the produc-

tion, harvesting, and preparation for market of tobacco or its seed, and its application to economical use?

HOPS.

1221. What has been the ratio of increase or decrease in the amount of hops grown in your State since the last Census?

1222. Designate the best varieties of hops cultivated with you, in the order of preference; their hardiness; the depth their main roots run into the soil; the length of the bines; periods of maturity; yield and flavor of the strobiles (hops); and the greatest and average price they bring, per pound, in your nearest market.

1223. What is the character of the soil and its aspect in regard to the sun, in which this plant best thrives?

1224. Have any experiments been made, within your knowledge, of under-draining hop plantations by tiles, and if so, what have been the results?

1225. What is the usual mode of propagation?

1226. In what manner is the ground prepared for planting?

1227. If manures are used, name the kinds, quantities allotted to an acre, their cost, the manner in which they are applied, and the duration of their effects?

1228. At what period do you usually transplant?

1229. How many plants do you allot to a hill, and at what distance are they set apart?

1230. What proportion of the plants are males?

1231. What culture does this crop require from March or April to the period of gathering?

1232. At about what date does the hop-picking commence?

1233. By what indications is it known when the crop is sufficiently matured for picking?

1234. Are hops dried with you by the natural radiation of heat, or by rapid currents of heated air passing through them in kilns?

1235. When artificial heat is applied for drying, to what temperature are the hops exposed, and what length of time is required to bring them to a sufficiently dry state?

1236. Is sulphur ever employed in curing hops, and if so, what are its effects?

1237. How many pounds of dried hops are allotted to a bale, and by what methods are they brought into form and compressed?

1238. What is the cost, per annum, of cultivating an acre of hops, including labor, implements, purchase of the roots, manure, interest and taxes on land, buildings, &c.?

1239. What is the greatest and average yield of hops, in pounds, to the acre?

1240. What are the annual net profits of an acre?

1241. What disposition is made of the bines after the hops are picked?

1242. When applied to land as a fertilizer, how do they compare, economically, with other manures?

1243. How does the hop, as an exhauster of the soil, compare with other crops?

1244. As an enduring plant, how long will it continue in profitable bearing, and how often do you find it necessary to replant?

1245. Where attention has been paid to rotation, with what crops has it been cultivated to the best advantage?

1246. By what insects or diseases is the hop attacked?

1247. What preventives or remedies have you for their ravages?

1248. Is there any other plant or tree growing in your State, either cultivated or wild, which contains *lupulin*, or any other principle that can be substituted for hops, and if so, describe its properties, yield, facility of culture or collection, and its comparative economy?

1249. What additional facts can you state in regard to the production, picking, drying, and baling of hops?

SUGAR-CANE.

1250. What has been the ratio of increase or decrease in the amount of cane sugar produced in your State since the last Census?

1251. What the amount of cane molasses, as above?

1252. How many gallons have been used in either of the last two years for the purpose of distilling?

1253. What quantity of sugar would you estimate is consumed by each person, man, woman, and child, in your section, per annum, in pounds?

1254. What quantity of molasses or syrup, in gallons?

1255. Designate the best varieties of cane cultivated in your section, in their order of preference; the color, length, and diameter of their stalks, with the distances of their nodes apart; their capacity to rattoon; their periods of maturity; power to resist frost, cold, and drought; and the per-centage and specific gravities of their juice by Beaumé's scale.

1256. What is the character of the soil of the localities in which these varieties best thrive, its elevation above sea-level, and the monthly means and extremes of temperature and the amounts of rain fallen, in each month of the year?

1257. Has under-drainage been adopted with you in the culture of sugar-cane, and if so, with what success?

1258. What proportion of the upper part of the stalks of the cane is regarded as unprofitable to grind, and is used for cuttings or fed to stock?

1259. In what manner is the ground prepared for planting?

1260. What manures, and how much to an acre or arpent, is added to the land, at or before the time of planting?

1261. At about what date are the slips cut for planting?

1262. In what manner are they preserved from frost during winter?

1263. At about what date are they planted?

1264. What are their usual lengths and the number of eyes to each?

1265. What distances are they planted apart?

1266. How many, and in what position are they inserted in the hill?

1267. When planted in ordinary soils, to what depth are they covered?

1268. When planted in an inclined position, in a moist soil, what proportion of the top-ends of the slips is left out of the ground?

1269. How many hills will a hand plant in a day?

1270. When irrigated with advantage, at what stage of growth of the young shoots may the watering commence?

1271. At the first and subsequent workings or hoeings, what fertilizers or manures do you employ, if any, how much of each kind to a hill, and in what manner are they applied?

1272. When the roots of the cane are protected from frost during winter, how many years will the plantations usually endure?

1273. Does the cane-plant ever flower with you, and if so, in what month?

1274. At about what date is the cane sufficiently matured to roll, or grind?

1275. How long does the rolling season usually last?

1276. In what manner are the canes preserved during the period of rolling, after being cut, from injury by frost?

1277. What is the greatest and average yield of trimmed canes, per acre, in pounds?

1278: What per cent., by weight, of the lower third of the canes is juice, and what the specific gravity of the latter by Beaumé's scale?

1279. What per cent., by weight, of the second, third, or middle of the canes, is juice, and what the specific gravity of the same?

1280. What is the greatest and average yield, per acre or arpent, of sugar, in pounds, and molasses, in gallons, produced by the several varieties of cane?

1281. How many pounds of crude sugar and how many gallons of molasses may be made from 100 gallons of cane juice?

1282. What of molasses or syrup, alone?

1283. How many gallons of syrup may be made from 100 gallons of juice?

1284. By what processes are these articles made?

1285. If sugar is manufactured and refined on the plantations, describe the machinery, apparatus, and processes employed.

1286. Has the plan ever been adopted with you of erecting a large sugar manufactory, driven by powerful steam-engines, and the juice evaporated by extensive vacuum pans, at a point accessible by water and railroads, that would admit of a safe and speedy transportation of the cane, and if so, with what results?

1287. What is the cost of cultivating and manufacturing an acre or arpent of cane, including labor, implements, purchase of manure, taxes and interest on land, buildings, &c.?

1288. What are the net profits of an acre or arpent of cane with you?

1289. What is the greatest and average price of crude sugar, per pound?

1290. What of refined sugar?

1291. What disposition is usually made of the "bagasse?"

1292. What of the "trash" left in the field?

1293. Are either or both of these substances ever converted into manure, and if so, by what means?

1294. Where the bagasse is dried and employed for fuel, how does it compare in point of economy with wood?

1295. What value is attached to the bagasse, per ton or cord?

1296. How does sugar-cane, as an exhauster of the soil, compare with other crops?

1297. Is it usually cultivated several years in succession on the same land, or is it alternated with other plants?

1298. If by the former, is deterioration the result?

1299. When attention is paid to rotation, with what crops can it be cultivated to the best advantage?

1300. To what accidents is the cane-plant liable with you?

1301. By what wild quadrupeds, insects, or diseases is it attacked?

1302. What preventives or remedies have you for their ravages?

1303. What additional facts can you state in regard to the production, harvesting, and manufacture of sugar-cane, and its application to any economical use?

SORGHUM-CANES.

1304. Is the Chinese or African Sugar-cane (*Sorghum saccharatum*) cultivated to much extent in your State, and if so, how many acres, per annum?

1305. Designate the best varieties in order of preference; the color, length, and diameter of their stalks, with the distances of the nodes apart; their power to resist frost, cold, and drought; and the percentage and specific gravity of their juice by Beaumé's scale.

1306. What is the character and aspect, in regard to the sun, of the soil that appears to be best adapted to this plant?

1307. In what manner is the ground prepared for planting?

1308. What manures are employed in the culture of this crop, the quantity of each to the acre, and how applied?

1309. About what date is the seed planted or sown?

1310. What quantity of seed do you apply to an acre, when planted in hills?

1311. What distances are the hills apart, and how many seeds do you drop in each?

1312. What quantity of seed do you apply to an acre, when planted in drills?

1313. What distance are the drills apart?

1314. What quantity of seed do you apply to an acre, when sown broadcast?

1315. How deep do you cover the seed?

1316. At about what dates, and how many times is the crop hoed or worked?

1317. At about what date do the panicles, or seed-heads, appear?

1318. At what date is the seed usually ripe?

1319. What is the greatest and average yield of seed, in bushels, to an acre?

1320. What the greatest and average weight of the seed to a bushel?

1321. What the greatest and average price, per bushel?

1322. To what uses is the seed applied?

1323. How does it compare in point of economy, measure for measure, when fed to animals, with oats or Indian corn?

1324. Has it been employed with advantage, in bread-making or any other form of human food, and if so, with what advantage?

1325. Has it been used for the purpose of malting or distilling, and if so, with what results?

1326. Has its pellicle, (outer covering,) been employed for dyeing silk or wool, and if so, with what success?

1327. What is the greatest and average weight of this plant, when green, produced to the acre, in tons or pounds?

1328. What the greatest and average weight to the acre, when dried?

1329. What the greatest and average value of the crop, per 100 pounds or ton, when green?

1330. What when dry?

1331. What is the cost of cultivating an acre of this plant, including labor, implements, purchase of seed, manure, interest and taxes on land, buildings, &c.?

1332. Have you made any experiments with this crop, either in a green or dry state, in feeding it to cattle, horses, sheep, poultry, or swine, and if so, with what results?

1333. Between what degrees of temperature will the stalks keep sweet, when stored in bulk, in a cellar or barn?

1334. What is the greatest and average yield of trimmed stalks to the acre, in pounds?

1335. What per cent. of the stalks, by weight, is available juice?

1336. How many pounds of trimmed stalks are required to produce a gallon of juice?

1337. What is the greatest and average yield of juice, in gallons, to the acre?

1338. How many gallons of juice are required to make a gallon of syrup?

1339. What is the greatest and average yield of molasses and crystallized sugar to the acre, in gallons or pounds?

1340. What the greatest and average number of gallons of syrup, alone, produced to the acre?

1341. What is the greatest and average price of each of the three above-named articles, per gallon or pound, in your home markets?

1342. How many gallons of the juice of this plant are required to make a gallon of alcohol?

1343. How many gallons of the molasses?

1344. How many of the syrup?

1345. What is the greatest and average value of the alcohol, per gallon?

1346. How many gallons of the juice are required to make a gallon of vinegar or wine?

1347. What is the price of each of these articles, per gallon?

1348. At about what temperature of the stalks and juice of this plant does the viscous fermentation commence?

1349. Has the manufacture of alcohol, vinegar, or wine been attempted with the juice after the viscous fermentation has taken place, and if so, what has been the result?

1350. To what would you attribute the failure?

1351. What effect does freezing have on the saccharine matter of the juice of this plant?

1352. Does this effect in any way impair its value, when immediately made into syrup or other economical use?

1353. Have you ever noticed whether the Chinese sugar-cane will mix, or hybridize, with broom-corn, Dourah, Guinea corn, African sugar-cane, (imphee,) or other allied plants, when cultivated in its vicinity, and if so, what benefit or injury was the result?

1354. To what accidents are these canes liable?

1355. By what insects and diseases are they attacked?

1356. What preventives or remedies have you, if any, for their ravages?

1357. Can you state any other facts, relating to the origin, extension, modes of culture, harvesting, preservation, value for feeding, and application or manufacture of this crop?

BROOM-CORN.

1358. What has been the ratio of increase or decrease in the cultivation of broom-corn in your State since the last Census?

1359. Designate the best varieties for broom-making, with the order of preference, taking into account their susceptibility to withstand cold, frost, wet, and drought; early or late maturity; the length and abundance of their "brush" (dried panicles, cleaned of the seed); and the most prolific in yield.

1360. Designate the best varieties for cultivating for seed.

1361. What is the character of the soil, and its aspect in regard to the sun, in which this plant will best thrive?

1362. When manure is added, is it applied before or after planting?

1363. When before, in what manner is it applied and what quantity to the acre?

1364. At about what date is the seed usually planted?

1365. What distances are the hills apart?

1366. How many seeds are dropped in a hill?

1367. What quantity is required to plant an acre?

1368. What depth is it covered?

1369. How many times do you hoe or work the crop?

1370. What manures or fertilizers do you add, if any, at the second working, and what quantity to a hill?

1371. At about what date do the panicles of the early varieties appear?

1372. What date those of the late varieties?

1373. At what stage of growth is it most advantageous to harvest the crop, when intended for brooms?

1374. In what manner do you gather and store the crop?

1375. What is the greatest and average yield of brush, in pounds or tons, to the acre?

1376. What is its greatest and average value, per pound or ton?

1377. At about what date is the seed fully ripe?

1378. What is the greatest and average yield, in bushels, to an acre?

1379. How is the seed separated from the brush?

1380. What is the greatest and average weight of the seed to a bushel?

1381. What is its greatest and average value, per bushel?

1382. When fed to animals, how does the seed compare, in point of economy, with oats or Indian corn?

1383. What is the cost of cultivating an acre of broom-corn, including labor, implements, purchase of manure and seed, interest and taxes on land, buildings, &c.?

1384. What are the net profits of an acre?

1385. Is the brush usually manufactured on the farms, or is it sold in bulk?

1386. What is the cost of turned broom handles, per 100, delivered on the farm?

1387. What is the cost of copper or iron wire, sufficient for 100 brooms?

1388. How many brooms or brushes will a man make in a day, the handles being formed?

1389. What is the greatest and average value of the brooms and brushes, per 100, in an abundant year?

1390. By what wild quadrupeds, birds, insects, or diseases is broom-corn attacked?

1391. What preventives or remedies have you, if any, for their ravages?

1392. Can you state any other facts relating to the cultivation, harvesting, preservation, and manufacture of this crop?

FOREST-CULTURE.

1393. What has been the ratio of increase or decrease in the amount of wood and timber in the forests or woodlands of your State since the last Census?

1394. To what cause do you attribute the change, if any?

1395. What proportion is of the first, second and third growth?

1396. What number of acres of forests or woodlands is owned by your State, within its own limits?

1397. What number, if any, by the General Government or other States?

1398. Designate the names of the indigenous trees of your section, in the order of their predominance, as near as practicable; their

general height, in feet, and diameter, at a yard above the ground: the rapidity and tardiness of their growth, respectively; and the probable age of the forest or wood in which they are contained.

1399. What are the principal geological formations, their extent, and the character of the soils of your woodlands?

1400. What is the character of the soils of your cleared lands?

1401. What metallic ores, if any, occur in your section, and if worked, have they had any effect in causing a scarcity of fuel?

1402. What trees constitute the growth of your now arable lands?

1403. In the successive growths on the same tracts of the forests of your section, has it been ascertained with certainty whether coniferous trees are succeeded by foliaceous ones, and *vice versâ*, and if so, to what cause may this phenomenon be attributed?

1404. Are any of your woodlands used for purposes of grazing or "browsing," and if so, what effect does it have on the growth of the trees?

1405. Are the fallen leaves of your forests employed for bedding in stables or yards, and if so, are the labor of collecting them and the detriment caused thereby to the renovation of the soil as well as to the future growth of the trees, compensated by their use as litter and their value as manure?

1406. In clearing your forests, has discrimination generally been made in regard to the classes, ages, and sizes of the timber felled, the quality and adaptation of the soil for arable crops, or for the future growth of trees?

1407. What effect has the clearing had upon your climate, in the diminution or disappearance of springs and streams, the annual amount of rain, hail, and snow, the occurrence of drought, thunder, and sudden gusts of winds, the drifting of sand, and the aridity of the soil?

1408. Has the clearing had any influence in decreasing the number of predatory birds, or increasing those more useful to the agriculturist, which subsist principally upon insects or their larvæ and the seeds of thistles or other foul weeds?

1409. On the other hand, in clearing your forests, what effect has it had, on the diminution of your crops by an increase of insects, injurious to vegetation, by drying and warming the soil, which are favorable for their metamorphoses and final growth?

1410. Has the cultivation of forest trees been encouraged in your State by legislative enactments by offering prizes, bounties, or other inducements to farmers, and if so, what?

1411. Designate the amount of acres thus planted; the number of tıees to the acre; their names, ages, and dimensions, with the objects of their culture.

1412. In what manner are the trees propagated, and what is their subsequent management?

1413. Have attempts ever been made to plant barren tracts, the tops and sides of hills, the arenaceous shores of rivers, lakes, and other waters, with appropriate trees, with the view of inducing vegetation, preventing thereby the drifting of sand, the washing

away of the soil, thereby checking inundation by the retention of the water by the plants, and facilitating its distribution and penetration into the earth, at times of heavy rains?

1414. Could not the damages often caused by floods in lower rivers be better obviated by the adoption of such natural means as those alluded to above, along the shores of their tributaries, than by the mere construction of dikes, or levees, as at present practised, in many instances, at the South?

1415. Have any measures been taken in your section to prevent the final destruction of forests or woodlands and the injurious consequences to agriculture, which would inevitably result therefrom, by adopting a judicious system of clearing, in the establishment of plantations, by propagating trees from seeds, sprouts, "suckers," or cuttings, or in removing young trees of spontaneous growth from near the borders of woods to the sites where they are intended to remain?

1416. In your opinion, would it not be advisable for the proprietors of large tracts of woodland to place them under the supervision of a professional silviculturist, with the object of selecting those trees which can be the most profitably felled, either for timber or fuel, and reserving such as are rapidly growing for future use—taking into consideration, at the same time, whether portions of said lands, susceptible of tillage, would not be more remunerative for pastures, meadows, gardens, orchards, or arable fields—whether they contain an abundance of metalliferous ores, beds of coal, marble, or other valuable stone for building, living fountains or streams of wholesome water, available for the purposes of navigation, the turning of mills, irrigation, and other economical uses—and lastly, what proportion should remain as forests, to equalize the balance of Nature, in respect to the climate and health of the region, a due quantity of useful birds, fish, or game, and the greatest support and general thrift of man?

1417. To what accidents are your forests or woodlands liable?

1418. By what wild quadrupeds, birds, insects, or diseases are the trees attacked?

1419. What preventives or remedies have you, if any, for their accidents or ravages?

1420. What amount of damages, in dollars, is estimated to be done in the forests of your State, per annum, by injuries from tornadoes or other winds, splitting or bursting of the trunks by freezing, breaking of the branches by excessive weight of ice and snow, undermining by floods, and destruction by lightning or fire?

1421. With the view of increasing its durability, facility of seasoning, prevention of warping, splitting, or attacks by worms, what season do you regard the most favorable for felling timber, when the trees contain the greatest or smallest quantity of moisture or sap?

1422. On what do you predicate this opinion?

1423. What season do you regard the best for felling trees for fuel, without interfering with other operations of the farm?

1424. Is there a scarcity of wood or timber in your region, or any difficulty of obtaining the same, for want of convenient modes of transportation?

1425. What is the greatest and average price of timber and lumber, of various kinds, per ton, foot, or 1,000, at your nearest market?

1426. What is the greatest and average price of white pine and spruce wood, per cord?

1427. What of hard or yellow pine?

1428. What of hickory, black walnut, sugar maple, and beech?

1429. What of other kinds of hard wood?

1430. What does it cost, per cord, to cut and pile the wood?

1431. What is the cost of transportation, per cord, of any of the above to your nearest market?

1432. What is the greatest and average number of cords consumed with you, per annum, as fuel, by a family of five or more persons?

1433. What amount of wood of various kinds enters into the commerce of your State, per annum, in cords?

1434. What are the greatest and average prices of quercitron, oak, hemlock, spruce or other kinds of bark, per ton or cord, in your nearest market?

1435. Do the farmers of your State generally use wood or coal for fuel, or a mixture of both?

1436. What is the greatest and average price of coal, per chaldron or ton?

1437. What disposition is made of the ashes produced in your region from wood or coal?

1438. When sold off the farm, what is the greatest and average price of wood ashes, per bushel, leached or unleached?

1439. What amount, in pounds, of maple sugar is made in your State, per annum, and what is its greatest and average value, per pound, in your nearest market?

1440. What amount of maple syrup, in gallons, and what is its value, as above?

1441. By what processes are these articles made?

1442. What is the greatest and average amount of sap, in gallons, produced by a full-grown maple in a day?

1443. What number of gallons in the season of its flow?

1444. From what part of the tree is the sweetest juice obtained?

1445. What is the greatest and average number of gallons of sap required to make a pound of sugar?

1446. What number of gallons to make a gallon of syrup?

1447. What effect has "tapping" on the longevity of the tree?

1448. What is the greatest and average age the sugar maple will attain?

1449. Have any attempts ever been made to cultivate this tree from seeds, or otherwise, for the purpose of sugar-making, with a view to profit, and if so, with what success?

1450. What other facts can you present in regard to the preservation, management, and economy of the forests or woodlands of your State, or concerning the properties, uses, demands, and values of their products?

ANIMALS AND THEIR PRODUCTS.

CATTLE.

1451. What has been the ratio of increase or decrease in the number of cattle in your State since the last Census?
1452. What breed do you consider the most serviceable for labor?
1453. In what does its superiority consist?
1454. What breed the most profitable for milk?
1455. On what is this preference predicated?
1456. What breed is the most valuable for beef?
1457. To what is this advantage attributable?
1458. Has crossing any of these breeds been attempted in your section, and if so, with what results?
1459. What is the cost of rearing to the ages of one, two, three or four years?
1460. What is the value of a bull, heifer, or steer at each or any of the above-named ages?
1461. What is the value of a working ox and of a milch cow?
1462. What is the cost of transportation, per head, alive, from the central parts of your State to the nearest inland or maritime markets, by river, canal, railroad, or on foot?
1463. What is the usual length of time required for this transportation?
1464. How many months in the year, if at all, are the cattle housed in your section?
1465. On what are they generally fed during this period?
1466. What amount of hay, grain, and roots is requisite to sustain a cow or an ox during this time?
1467. What is the greatest and average quantity of milk given by a cow, per diem, when thus housed and fed?
1468. What the greatest and average market value of the milk during this period, per gallon or quart?
1469. What is the greatest and average weight of butter, per week, produced by a cow during the housing season?
1470. What the greatest and average price of butter, per pound, during this season?
1471. At about what date are cows usually turned out to pasture in the spring?
1472. What is the greatest and average quantity of milk given by a cow, per diem, during the period of pasturing?
1473. What is the greatest and average market value of the milk during this period, per gallon or quart?
1474. What is the greatest and average weight of butter, per week, produced by a cow during the pasturing season?
1475. What is the greatest and average price of butter, per pound, during this season?
1476. Have you an improved method of making butter, and if so, what?

1477. What is the greatest and average weight of cheese, per week, produced to a cow during the time?

1478. What is the greatest and average price of the cheese, per pound?

1479. Have you an improved method in making cheese, and if so, what?

1480. If "soiling" is practised with you, what advantages does it possess over pasturing, or allowing the cattle to run at large?

1481. What proportion of a cow's milk is allotted to her calf, prior to slaughtering or weaning?

1482. What is the greatest and average price of veal?

1483. What is the most approved method of feeding calves after weaning?

1484. Do your cattle require salt any portion of the year?

1485. What quantity do they consume, each, per annum?

1486. What is the greatest and average live-weight of an ox or beeve?

1487. What is the greatest and average weight of an ox or beeve, when dressed?

1488. What per cent. is tallow, when tried?

1489. What is the greatest and average price of fresh beef, per pound, during summer and fall?

1490. What is the greatest and average value in winter and spring?

1491. What is the value of mess beef, per barrel?

1492. What is the greatest and average value of tallow, per pound?

1493. What additional facts can you offer in regard to the history, pedigree, breeding, rearing, economy of feeding, and the preparation of the milk and flesh of cattle, either for market or domestic use—or in regard to the construction and internal arrangement of barns, stables, or yards?

HORSES.

1494. What has been the ratio of increase or decrease in the number of horses in your State since the last Census?

1495. What breed do you consider the best for "all work," or general use?

1496. On what does its superiority depend?

1497. What is the greatest and average value of horses of this breed, at the age of three years?

1498. What breed is preferred for a carriage or heavy draught?

1499. Point out the advantages of this over other breeds adapted for this class of work.

1500. What is the greatest and average value of horses of this breed, when three years old?

1501. What breed is regarded as the best for roadsters, or stage coaches?

1502. What is the greatest and average value of the same, at the age of three years?

1503. What breeds or races have you distinguished for the turf?

1504. Has the general character of your horses been improved by crossing, and if so, what have been the results?
1505. What is the greatest and average value of breeding horses and of mares of various grades?
1506. What is the greatest age at which you have known them to arrive?
1507. What is the average longevity of horses in your section?
1508. What of mares?
1509. To what is this difference of age to be attributed?
1510. What is the cost of rearing a colt, per annum, until it is three years old?
1511. What is the cost of transporting a horse from the central parts of your State to the nearest inland or maritime market, by river, canal, railroad, or on foot?
1512. What length of time is required for this transportation?
1513. What months of the year do your horses subsist principally on grass?
1514. What other food do they eat when pastured?
1515. How many months are they fed in stables or yards?
1516. On what are they most advantageously fed, when stabled?
1517. What does it cost, per week or month, in winter and spring to keep a horse in stable?
1518. What the cost, per week or month, in summer and autumn, when pastured?
1519. What quantity of hay and grain will a horse consume, per week or month, when confined to stable or yard?
1520. Can you state any additional facts concerning the history, pedigree, breeding, rearing, and management of the horses in your region, or economy in the construction and internal arrangement of stables, improvement in harnesses, modes of shoeing, &c.?

ASSES AND MULES.

1521. What has been the ratio of increase or decrease in the number of asses and mules in your State since the last Census?
1522. What is the cost of rearing an ass or mule, per annum, until three years old?
1523. What is their greatest and average value at that age?
1524. What is the greatest age at which you have known an ass or mule to arrive?
1525. What is their average longevity?
1526. What is the greatest and average price of jacks and jennies, suitable for breeding?
1527. On what are asses or mules the most advantageously fed?
1528. What does it cost, per week or month, to keep one in winter and spring?
1529. What, per week or month, in summer and autumn?
1530. What is the value of ass or mule labor, as compared with that of oxen or horses?
1531. Can you state any additional facts concerning the history,

breeding, rearing, and management of asses and mules, or of their advantages or disadvantages, as compared with other animal labor?

SHEEP.

1532. What has been the ratio of increase or decrease in the number of sheep in your State since the last Census?
1533. What breeds do you consider the most profitable for "fine" wool?
1534. What are the comparative merits of the Spanish Merinos, Saxons, and Rambouillets?
1535. What is the greatest and average value of a sheep of each of these races at a year old?
1536. What is the greatest and average weight of the first and after-fleece?
1537. What the greatest and average value, per pound, of these fleeces, washed or unwashed?
1538. What breeds do you consider the best for "long" wool?
1539. What is the greatest and average value of a sheep of each or any of these races at a year old?
1540. What is the greatest and average weight of the first and after-fleece?
1541. What the greatest and average value, per pound, of these fleeces, washed or unwashed?
1542. What breeds are preferred for "middle" wool?
1543. What is the greatest and average value of a sheep of each or any of these races at a year old?
1544. What the greatest and average weight of the first and after-fleece?
1545. What the greatest and average value, per pound, of these fleeces, washed or unwashed?
1546. What is the diminution, per cent., in the wool by washing in each of these breeds?
1547. What breed is regarded the best for their flesh?
1548. At what age are they most profitably killed for mutton?
1549. What is the greatest and average weight, when dressed, at that age?
1550. What the greatest and average price of mutton, per pound?
1551. What the value of mutton tallow, per pound?
1552. What is the greatest and average weight of the first and after-fleece?
1553. What the market value, per pound, of these fleeces, washed or unwashed?
1554. What the greatest and average value of the lambs of any or all of the preceding breeds, not exceeding six months old?
1555. What is the greatest and average value of the felts, each?
1556. What is the greatest and average price of the flesh of lamb, per pound?
1557. What is the cost of rearing a lamb to the age of six months?
1558. What the cost, per annum, of rearing a sheep?

1559. What is the greatest and average value of a good tup, and of a ewe, fit for breeding?

1660. What is the cost of transportation of sheep, per head, from the central parts of your State to the nearest inland or maritime market, by river, canal, railroad, or on foot?

1561. What length of time does this transportation require?

1562. What months in the year do the sheep of your region feed exclusively on pasture or "range?"

1563. What effect does white clover or the "short" grasses, when depastured by sheep, have on the quality of their wool?

1564. What effect red clover, or the coarser grasses, when thus fed?

1565. If yarded or housed, in winter and spring, during what months?

1566. On what are they most advantageously fed, when thus confined?

1567. Do the sheep in your region require salt, either when grazing or when fed upon hay?

1568. What quantity of salt does a sheep advantageously consume during the several seasons of the year?

1569. Of what number do your largest flocks consist?

1570. How many ewes do you allow to a ram?

1571. Do the ewes in your region procreate more than once a year, and if so, how often, and what is the usual number of lambs at a birth?

1572. Have the sheep of your section been improved in any manner by crossing, and if so, what?

1573. Are they protected by legislative enactments against the ravages of dogs, wolves, or other predatory animals?

1574. What per cent. of sheep and lambs is destroyed, per annum, by these pests?

1575. Are your flocks ever accompanied by night or day by shepherds or dogs?

1576. When shepherds are employed, what wages do they receive, per month or year, with or without board?

1577. What breed of sheep-dogs do you consider the best?

1578. What is the value of a good sheep-dog of this breed?

1579. On what are these dogs principally fed?

1580. What is the cost of sustaining one for a month or year?

1581. State such other facts concerning the history, breeding, rearing, and management of any of the preceding races of sheep, and the preparation of their wool for market, as may have come under your experience or observation; also with regard to sheep-folds, yards, pens, or shelter from the sun, wind, or rain.

GOATS.

1582. Has the rearing of Asiatic or Cashmere goats been attempted in your State?

1583. By whom, when, and whence were they introduced?

1584. What number is supposed at present to exist within your State?

1585. What is the greatest and average value of full-blooded bucks, at one year old?

1586. What the greatest and average value of full-blooded does at that age?

1587. What the greatest and average weight of the first and after-fleece of pure-bloods?

1588. What the greatest and average market value of the wool, per pound?

1589. To what uses has this wool been applied?

1590. At what age do these goats procreate?

1591. Have they been crossed with the common goat, and if so, what has been the character of their progeny?

1592. What is the greatest and average value of a male and of a female, when thus crossed.

1593. Are the crosses capable of engendering, and if so, what is the character of their offspring?

1594. What proportion of births is males or females, either in crosses or pure-bloods?

1595. Will the machinery ordinarily employed for manufacturing the wool of sheep answer for the manipulation of the hair or down of these goats?

1596. What is the greatest and average weight of the first and after-fleece of the crosses?

1597. What is the greatest and average price of their wool, per pound?

1598. What of the pure-bloods?

1599. To what uses have these wools been applied?

1600. How does the quality of the flesh of the kids, when cooked, compare with that of venison or lamb?

1601. What is the greatest and average value of their flesh, per pound?

1602. Do these goats, either full-blooded or crossed, associate peaceably in pasture with sheep?

1603. Are they in any manner a protection against the ravages of dogs and wolves?

1604. Have you devised any plan to prevent them from barking fruit trees or ornamental shrubs?

1605. Can you state any additional facts in reference to the economy or disadvantage of these animals?

SWINE.

1606. What has been the ratio of increase or decrease of swine in your State since the last Census?

1607. What breed do you consider the most profitable for salting for army or navy use?

1608. What is the greatest and average value of mess pork, per barrel?

1609. What the expense of packing it, per barrel?

1610. What breed do you consider best for hams or family use?

1611. What is the greatest and average value of prime bacon and hams, per pound?

1612. What the greatest and average price of prime or family pork, per barrel?

1613. What the greatest and average price of the best lard, per pound?

1614. What the greatest and average value of shoats or hogs, live weight, per pound?

1615. What the greatest and average weight of a shoat when dressed?

1616. What the greatest and average weight of a hog when dressed?

1617. What the greatest and average price of the flesh of a shoat, uncut, per pound?

1618. What the greatest and average price of the flesh of a hog, uncut, per pound?

1619. What the greatest and average price of choice pieces of fresh pork, per pound?

1620. When butchered hogs are tried, what per cent. of their weight is lard?

1621. What is the greatest and average price of lard, per pound?

1622. What disposition is made of the "graves," or scraps?

1623. What are they worth, per pound?

1624. What disposition is made of the bristles of hogs?

1625. If sold, what do they bring, per pound?

1626. Are the hair, blood, bones, and offal, of slaughtered animals of any kind, used in manufactures or for manure?

1627. What prices do any of these articles bring, in a crude state, per pound or ton?

1628. Do the hogs of your State generally run at large, feeding on grass, roots, and mast, or are they yarded and fed upon the refuse of the kitchen, dairy, &c., and fattened upon potatoes and corn?

1629. What is the comparative value of 100 bushels of corn, when sold at your usual market price, and when fed and sold in pork?

1630. What is the comparative value of 100 bushels of corn and an equal quantity of potatoes combined, for the last-named purpose?

1631. How many pounds of pork may be made of a bushel of corn, raw or cooked?

1632. How many pounds may be made of a bushel of corn and a bushel of potatoes combined, raw or cooked?

1633. What is the cost of transportation, per head, by river, canal, railroad, or on foot, to the nearest inland and maritime market?

1634. What length of time does it require for this transportation?

1635. Has the quality of your swine been improved in any manner by crossing, and if so, what?

1636. State such other facts concerning the history, breeding, and management of the different races of swine, and the preparation and preservation of their flesh, as may have come under your experience

or observation; also, with regard to the construction and internal arrangement of the pens, sties, or yards, for their accommodation.

POULTRY AND EGGS.

1637. What has been the ratio of increase or decrease in the valuation of poultrv and eggs in your State since the last Census?

Domestic Fowls.

1638. What are the number and value of domestic fowls annually produced in your State?

1639. What is the cost of rearing them, per pair?

1640. On what are they most profitably fed?

1641. On what are laying hens the most advantageously kept?

1642. Is their laying increased by feeding on animal food?

1643. Are they in any case profitably kept in apartments artificially warmed, with a view of increasing their laying in winter or spring?

1644. What is the expense of keeping laying hens, per dozen or 100, a year?

1645. What is the largest number, kept in a body, that will advantageously thrive?

1646. When kept in large numbers, what uses are made of their dung?

1647. What does this article bring, per bushel or 100 pounds?

1648. What is the greatest and average price of eggs, per dozen, at different seasons of the year?

1649. At what would you estimate the number and value of eggs at present produced in your State, per annum?

1650. Is it customary with you to keep more than one breed of males on the same plantation or farm?

1651. Are there any advantages or disadvantages in crossing the different breeds, in reference to the flesh or eggs of the offspring?

1652. What breed of domestic fowls do you consider the best for their flesh?

1653. What is the greatest and average weight, per pair, when fattened, at the age of six months?

1654. What is the greatest weight of capons, each?

1655. What is the greatest and average value of fowls, per pair, caponized or not?

1656. What breed do you consider the best for laying?

1657. What is the greatest and average number of eggs produced by a hen in a year?

Turkeys.

1658. What are the number and value of turkeys produced in your State, per annum?

1659. On what are they most profitably fed?

1660. Are they reared advantageously on tobacco plantations, with the object of destroying worms?
1661. What is the cost of rearing them to the ages of six, eight, and twelve months?
1662. What is the greatest and average weight of a turkey at the age of six or eight months?
1663. What is the greatest and average price at these ages?
1664. What the cost of transporting live turkeys to your nearest market, per dozen or 100?
1665. What length of time does it require for this transportation?

Geese.

1666. What are the number and value of geese produced in your State, per annum?
1667. What breed do you consider the best?
1668. On what are they most advantageously fed in winter and spring?
1669. What is the cost of rearing to the age of eight and twelve months?
1670. What the greatest and average value of geese, each?
1671. What the value of their feathers, per pound?

Ducks.

1672. What breed of ducks have you in your State, and which kind do you consider the best?
1673. How do the profits of raising them compare with those of geese or domestic fowls?
1674. Can you state any additional facts in reference to the breeding, management, and domestic accommodation of poultry in general?

WILD QUADRUPEDS AND BIRDS.

1675. Have any experiments been made in domesticating American wild quadrupeds or birds, for purposes of utility or economy, in your State, or in crossing them with the domestic breeds, and if so, what have been the results?

FISHES.

1676. Has there been any diminution in the supply of fish in the rivers, lakes, ponds, or other waters of your State, to your knowledge, and if so, to what may it be attributed?
1677. Are fish of any kind in your section protected by legislative enactments?
1678. Have the propagation and culture of fish by artificial means been adopted with you, and if so, what kinds, and by what methods?
1679. On what food, if at all, are they fed?

1680. What fishes will exist in the same waters without destroying each other or their spawn?

1681. Have any experiments been made of confining salmon, shad, or other fish which frequent the sea, in artificial ponds or lakes, during one or more years, and if so, state what kinds, and the results?

1682. Have any experiments been made in transferring the fishes or their ova (spawn) from the waters of one locality to those of another, and if so, what?

1683. What amount and value have been taken, per annum, in the fisheries connected with your State, for commercial purposes?

1684. What disposition is made of the offal of the fish thus caught?

1685. What is its value, per bushel or ton?

1686. By what process is it manufactured into manure?

1687. What is the greatest and average price, per pound, dozen, or 100, of fresh fish of various kinds in your market?

1688. Have you any other remarks to offer relative to the habits, breeding, management, modes of catching, preservation, or preparation of fish of any kind?

BEES.

1689. What has been the ratio of increase or decrease in the amount of beeswax and honey produced in your State since the last Census?

1690. How many swarms usually issue from a hive in a season?

1691. What is the greatest and average value of bees, per swarm, at one or more winters old?

1692. On the flowers of what plants do they most advantageously thrive?

1693. What plants are the most objectionable to bees?

1694. What is the greatest and average weight of wax and honey produced to a hive?

1695. The labor of collecting one pound of wax is equivalent to that of how many pounds of honey?

1696. What is the greatest and average price of honey, per pound?

1697. What of wax?

1698. Are the swarms subject to the ravages of the bee-moth?

1699. What preventives or remedies have you, if any, for warding off or destroying this enemy?

1700. What is the greatest degree of cold you have known bees to resist without injury or loss?

1701. Do bees, from your knowledge, ever survive a perfect state of torpidity?

1702. Do they necessarily consume more or less honey during severe winters than those which are mild?

1703. Can you state anything, in addition, concerning the habits, economy, and management of bees, and the comparative merits of the various descriptions of hives?

SILK-WORMS.

1704. What has been the ratio of increase or decrease in the amount of cocoons, or raw silk, produced in your State since the last Census?

1705. What has been the cause of this increase or diminution?

1706. What has been the greatest and average price paid for cocoons at any period?

1707. Could not this class of industry, in your judgment, be pursued with advantage by pauper labor, or in connection with common or district schools?

1708. Can you present any other facts in regard to the cultivation of the mulberry in your State, the rearing and management of silk-worms, or the economy and manufacture of their product?

AGRICULTURAL IMPLEMENTS AND MACHINES.

1709. Designate the best implements of various kinds employed in the husbandry of your section, with the cost of each; the names and post-office address of the manufacturer or vender, and any information concerning their advantages or use.

1710. Designate the best agricultural machines, with the cost of each; the address of the manufacturer or vender; the cost of running or working, per diem, whether by animal power or steam; the amount of work they will perform in a day; and their durability and cost of repair, per annum.

REMARKS.

As the preceding Interrogatories embrace a wide field of inquiry and occupy considerable space, it is not deemed expedient to extend them further at this time. Should the subject be resumed, however, in the next Report, the following topics would prove equally interesting to statists and others engaged in the investigation of our progress and future well-being:

Agricultural Science, embracing Economic Zoology, Economic Botany, Economic Geology, and Meteorology.

Rural Economy, embracing Landscape Gardening, Inclosures, Country Residences, and Farm Buildings.

Political Economy, embracing Public Encouragement of Agriculture and Rural Economy; Internal Improvements; Disposal of Town Refuse, or Sewage; Public Hygieine; Agricultural Education; Agricultural Societies, Boards, etc.; Agricultural Insurance and Mutual Protection; Employment of Agricultural Capital; Support and Employment of the Poor; Diminution of Pauperism; Prison Discipline; and the Prevention of Crime.

D. J. B.

SOCIETIES FOR PROMOTING AGRICULTURE, STATE BOARDS, ETC.

In the Agricultural Report of the Patent Office for 1857, (page 20,) allusion was made to the beneficial influence of agricultural associations and economical societies; and historic sketches were given in chronological order with respect to the periods of formation of a number of these organizations as accurately and fully as the data at command and a due regard for conciseness would permit. A circular was addressed by the Commissioner of Patents November 1, 1858, to the Corresponding Secretary or other appropriate officer of every association of this character in the United States known to him, asking for information respecting the name or designation of each; its date of organization and charter; number of members; amount of initiation fee and of annual dues of members; amount of life membership fee; other sources of revenue; amount of funds and real estate possessed; periods of shows or fairs; amount paid for premiums annually; largest premiums ever offered and for what objects; amount paid annually for experiments; whether a nursery, trial-ground, or experimental farm is owned or occupied; amount expended for cuttings and seeds for distribution; whether a volume of transactions is published annually or at any other period, and what number of copies and of pages; the number and value of the volumes in each library; whether an agricultural museum or collection of models, implements, or specimens of natural history is owned, and of what they consist; how many and what kinds of domestic animals are kept for breeding; and finally, what benefits result from these organizations, respectively, in the diffusion of agricultural knowledge, the improvement of domestic animals, and the increase in crops.

The information received up to the present time, condensed from the reports of the secretaries or other officers, is presented in the succeeding pages as a gratifying evidence of the success and great utility of the united efforts of intelligent communities in promoting the cause of agriculture; and the hope is cherished that the operations of all the associations in the country established for similar purposes may yet be obtained and published in like manner.

The following table exhibits the number of the various Boards and Societies existing in the United States connected wholly or in part with agriculture, as far as the records of the Patent Office extend:

STATES AND TERRITORIES.	Agricultural.	Horticultural.	Agricultural and mechanical.	Total.
Alabama	7			7
Arizona Ter.				
Arkansas	2			2
California	6	2		8
Carson Ter.				
Columbia, District of				
Connecticut	10			10
Dakotah Ter.				
Delaware	3	1		4
Florida				
Georgia	10			10
Illinois	86	2	6	94
Indiana	73	2	2	77
Indian Ter.				
Iowa	66	1	7	74
Kansas	1			1
Kentucky	6	2	6	14
Louisiana	2	2		4
Maine	17			17
Maryland	8		2	10
Massachusetts	34	7	2	43
Michigan	26	2		28
Minnesota	28	1		29
Mississippi	13	1	2	16
Missouri	16		16	32
Nebraska Ter.	11			11
Nevada Ter.				
New Hampshire	7			7
New Jersey	13		3	16
New Mexico Ter.				
New York	79	9	9	97
North Carolina	8			8
Ohio	69	5		74
Oregon	2			2
Pennsylvania	65	3	3	71
Rhode Island	2			2
South Carolina	12	1		13
Tennessee	12		8	20
Texas	23		1	24
Utah Ter.	1			1
Vermont	16			16
Virginia	23		3	33
Washington Ter.	2			2
Wisconsin	33	2		35
Total	799	43	70	912

CONDENSED REPORTS.

Alabama State Agricultural Society.

Organized January 10, 1855, and chartered February 14, 1856. Our present number of life members is 182. Annual members pay $5 each, and those for life $25. The State gave the Society, at the time of its charter, $5,000. We possess 30 acres of Fair grounds, with improvements, all valued at $20,000. An annual exhibition is held, when about $3,000 are paid for premiums, the largest being for the best cotton-gin and Alabama-built steamboat, each $50; for the best Alabama-made cotton-gin, $30; and $25 and $20 are our common awards for the best stock, horses, cattle, jacks, swine, &c. We publish our transactions in the "Cotton Planter."

The most important benefit resulting from our Society is the spirit of land improvement, by "horizontalizing" and fertilizing, which is prevalent among our planters. Stock is also better, horses, mules, milch cows, and superior breeds of swine. We are giving much attention to diversifying our crops, combining to a proper extent farming, grazing and stock purposes, with planting. An evident and large increase has been exhibited in all our agricultural products for the last few years. There is no estimating the quantity we could produce, had we sufficient information to enable us to counteract the ravages of various insects that prey upon our crops, unmolested, by day and night. In the manufacture of "domestics," and in the "Ladies' Department" generally, such has been the advance that we are amply compensated for all our trouble and expense.

Lowndes County Agricultural Society, Alabama.

This Society was organized July, 1858. The present number of members is 50, each paying $2 50 initiation fee.

Considerable interest is felt in this association, and, composed as it is of intelligent and wealthy planters, much good will undoubtedly result from its operations.

Clark County Agricultural Club, Arkansas.

This Club was organized in November, 1857. The present number of members is 40, each paying $5 at initiation. We hold an annual Fair. No premiums have yet been offered. An address is delivered each year, and printed. We publish our transactions, by agreement, in the county newspaper, and are entitled to two columns. Members are required to exchange the agricultural works for which they may

subscribe. For purposes of breeding, we possess three sheep and ten imported swine.

The general character of our farms has been improved. In our meetings, we communicate our experiments with the varieties of cotton and corn; keeping as well as planting sweet potatoes, and the different grasses. The system of hill-side ditching has been introduced by us, and a method of clearing lands adopted, instead of the old plan of girdling the trees. Better crops have resulted under the spirit of emulation excited by the action of our Club, through its examining committees.

California State Agricultural Society.

This Society was organized and chartered May, 1854. The present number of members is 675, each paying $10 initiation fee, and $5 annually; or $50 for life. We obtain further funds by an appropriation from the State of $5,000, to be expended for premiums, only, and also by charges of admission to the shows. A Fair is held yearly. In 1858, $6,762 were awarded as prizes, the largest being $200, for the best improved and furnished farm. Our transactions are published. In 1857, they were in pamphlet form, consisting of one hundred and ninety-two pages, and one thousand seven hundred copies. We have a library, recently commenced, containing one hundred and twenty-five volumes; also a museum, embracing from two hundred and fifty to three hundred specimens, mostly illustrative of the natural history of the State.

As to the benefits resulting from this Society, only an aggregate answer can be given, which will perhaps be rendered more clear by illustrations. The three counties in which the most recent State Fairs have been held are believed, by competent judges, to be worth $500,000 each, more than they would otherwise have been. An interest has arisen in the rearing of pure-blooded stock, and in the cultivation of better kinds of grain and fruit. In 1858, four hundred and eighty-six volumes of agricultural works were distributed, mostly Patent Office Reports, and seven hundred and seventy packets of seeds, principally from the same source. We have in preparation for the Transactions of 1858 statistical accounts of three hundred and seventy-eight farms, orchards, vineyards, mining operations, &c., which will add to the exhibit of our resources, but will yet not fully reveal the good accomplished by our Society.

Connecticut State Agricultural Society.

This Society was organized and chartered June 22, 1852. The initiation fee is $1, and an equal sum annually, for each, while $15 are required for life membership. From the State, we receive $2,500 a year, and the city where the Fair is held pays from $2,000 to $3,000.

The balance of funds is gained from members' fees and admission to the grounds.

We hold an annual exhibition, when about $4,000 are awarded in premiums, the largest being $50 for farms. For experiments, we appropriate nothing, but pay a salary to the chemist of our Society. A volume of Transactions is published annually, consisting of about three hundred pages. Four thousand copies are printed. Our library is small, principally composed of exchanges with kindred associations.

A great impetus has been given to the agricultural interests of the State by the operations of the Society, as seen in the improved methods of culture, the introduction of valuable animals into all sections, and a general improvement of stock. An agricultural paper has been issued, which meets with liberal encouragement. A chemical investigation of all commercial manures found in the market is made each year, and analyses are begun of the peat and muck of the State.

Fairfield County Agricultural Society, Connecticut.

This Society was organized February, 1840. The present number of members is from 1,200 to 1,500, each paying $1 a year; or $10 for life. An appropriation of $200, per annum, from the State, and admittance charges further increase our funds. We own a tent, worth $800, and have $500 in cash. A Fair is held annually, when $1,000 are awarded as premiums, the largest being $50 for lines of trees planted by the road-side. We pay $100 a year for an address.

The improvement in farms and domestic animals, alone, clearly attributable to the emulation produced by our exhibitions, is believed by competent judges to have augmented the tax rates of the county over $300,000 within the past eight years.

Farmers' Club of Ridgefield, Fairfield county, Connecticut.

Organized November 24 1856. This Club now contains 24 members. The initiation fee of membership is $1, and our other mode of obtaining funds is by contributions.

Our first Fair was held last October, and proved a decided success, almost every farmer exhibiting some valuable production. The show of stock, fruits, and vegetables was very fine; and the whole result of great advantage. The premiums are only honorary. We expend no money for cuttings and seeds, but exchange with each other, and distribute those received from the Patent Office. Fifty volumes constitute our library, estimated at $30.

Much good has resulted from our organization. About fifty copies of agricultural journals are taken here, and these, together with our discussions, have produced an improvement in under-drainage, manuring, &c. Better crops are grown, and a pleasant and profitable rivalry now exists, not only among our members, but the citizens generally. Our Fair exceeded expectations. It was an assem-

bling, by common consent, without admittance charge or award of prizes.

Middlesex County Agricultural Society, Connecticut.

This Society was organized August, 1840, under a general law. The present number of members is 200, each paying $1 initiation fee, and an equal sum yearly; or $10 for life. The receipts of the exhibitions further increase our funds. We have a lease of grounds. An annual Fair is held, when $500 are awarded as premiums, the largest being from $10 to $15 for farms and horses. Our transactions are published in the newspapers.

Without doubt, knowledge has been disseminated and good has been done.

Tolland County Agricultural Society, Connecticut.

This Society was organized August 29, 1853. Our present number of members is 1,024, each paying $1 initiation fee, and 50 cents, annually. For life membership $15 are required. As further modes of obtaining funds, we charge 25 cents for admission at the gate of the grounds, to be paid for every person and horse, (not including the persons of members' families and their horses,) by which charges about $450 are received. We also have an appropriation of $200 from the State. The use of 18 acres of land has been allowed to us for the purpose of inclosing, on which we have just paid $800 of the $1,000 required.

Generally in October of each year, a Fair is held, when $600 are expended for premiums, the largest being $15 for farms and reclaimed lands. Our transactions occupy about thirty pages in the Report of the State Agricultural Society.

We have greatly improved our breeds of cattle, and increased largely the number of Devons. The best varieties of sheep and swine have become general. Increase of crops is not so remarkable as the improvement of lands by under-draining, wall-laying, orchard-setting, pruning, and grafting. The question among many has been, not how much can be obtained from the farm, but how much can be expended on it, and where to the best advantage. Among the poorer classes, it has been, how to support the family, and feed all the produce out upon the farm. Fruit, this year, has produced the greatest income to the county of any crop; and the varieties have largely increased.

Windham County Agricultural Society, Connecticut.

Our Society was organized February 2, 1852. We have no particular charter, but a general recognition by the laws of the State.

The present number of annual and life members is 550. The yearly payment of each member of the former class is $1, and of the latter, $5. By admission fees to the exhibitions, we further increase our funds. In real estate, we possess $1,000, which will probably be doubled this season by the erection of a building 40 by 100 feet, to be paid for by voluntary subscriptions. We hold a Fair, annually, when from $550 to $650 are expended for premiums, the largest being $15, for horses and town teams. At the quarterly meetings in March, grafts, seeds, and cuttings are exchanged. For the last few years, our transactions have been published in the volumes of the State Society.

More attention is paid to the cultivation of fruit. Many new and valuable varieties are generally disseminated—apples, pears, and grapes, in particular. A stimulus has been imparted to the introduction and rearing of improved breeds of cattle, horses, and swine, a marked change being perceptible in the stock on exhibition at our Fairs from year to year. A spirit of emulation has been excited among the farming community. As a consequence, seeds are more carefully selected, better manure and cultivation are applied, and excellent crops follow. There has also been a manifest improvement in the quality of two of the staple products of this county, namely, butter and cheese.

Delaware Horticultural Society.

The date of our organization was June 16, 1836, and of the charter, January 29, 1847. We have at present about 140 regular and 40 honorary and corresponding members. The annual payment is $1 each; $15 entitling to life membership. Our funds are increased by receipts at the exhibitions, whereby we have sufficient for current expenses. A Fair is generally held in September, when about $200 are paid for premiums, the largest of which are for the best display of vegetables, the best fancy designs formed of cut flowers, &c., $5 each.

We have at various times appropriated money for cuttings and seeds, to be distributed. About fifty volumes are in our library, worth probably $100.

The benefits of our Society are seen in our markets, in the improved variety, quantity, and quality of vegetables and fruits on s le.

New Castle County Agricultural Society, Delaware.

Our Society was organized May 7, 1836, chartered February 24, 1837, and renewed in the same year. The present number of members is about 400. No initiation fee is required, but the annual payment of $2 entitles to membership. A Fair is held each year, and about $300 paid for premiums; the largest offered was $50, for sugar from Indian corn. We have occasionally paid $50 per annum for

experiments. Our exhibition grounds, leased for a term of years, are spacious, and inclosed with a high fence. They contain comfortable covered stalls for animals on show, and houses for the display of domestic manufactures, farm products, &c.

Agriculture has largely improved through the exertions and example of this Society; and domestic animals, especially those for the dairy, were never before in so prosperous a condition. Farms have been enriched and rendered much more productive. Better dwellings have been erected and the out-buildings made more commodious and convenient. The price of land has also increased.

Farmers' Club of Rehoboth, Sussex county, Delaware.

This Society was organized January 1, 1852, and at present contains 25 members, each paying an initiation fee of 25 cents, and 10 cents monthly; or $1 20 per annum. Contributions and fines for non-attendance furnish additional funds. We possess about $100 in cash, and a Fair ground. An annual exhibition is held, when $50 are awarded as premiums, the largest being $1, each, for horses, cattle, swine, sheep, poultry, grain, vegetables, fancy articles, farm implements, &c. Annual addresses, only, are published.

The crops are more thoroughly tilled, and deep ploughing is followed by good manuring. Domestic animals have improved. There is less interest felt in the operations of our Club than we desire to see; but, by means of an appropriate building, which we contemplate, and by the establishment of a suitable library, we trust soon to receive a more welcome reward for our labors.

Southern Central Agricultural Society, Clark county, Georgia.

Organized in 1846, and chartered in 1849. Our present number of members is 800. The amount of initiation fee is $2; for ladies, each, $1; and annual payments of equal sums; while the charge for life members is $25. Donations from the cities where our Fairs are held are our other means of obtaining funds. We own 25 acres of land, where a Fair is held yearly, when from $3,500 to $5,000, according to the state of the treasury, are paid for premiums. The largest prizes we have offered were five of $50 each, for the following objects: The best cotton-gin; best steam-engine, at work on the grounds; best managed cotton plantation; best managed grain and stock farm; and the best essay on reclaiming exhausted lands. We usually publish our prize essays and addresses in the agricultural papers, though we have issued a volume of four hundred and eight pages. Our library, deposited in the State College, contains one hundred and five volumes.

In every respect, manifest benefits have resulted from the Fairs of this Society, particularly in deep ploughing and "horizontal" cultivation; manufacture and application of manures; greater attention

to the rearing of stock, developing the good points of native animals, the introduction of superior breeds, as the Cashmere goat, which is better for food than mutton, is more hardy, protects itself from dogs, and has more valuable wool; the Nagore cattle from India, which, so far, have been exempt from murrain and blains, while other cattle in the same pastures have suffered; the cultivation of grasses and forage crops; obtaining the best kinds of fruit, whether foreign or native, and in many cases raising new seedling varieties; the encouragement of manufactures; and the increase of general crops. Our Fairs also benefit those of our community who cannot read agricultural papers; for they see improvements, and learn to imitate, thus profiting in their minds and manners.

Agricultural Club of Chatham and Effingham counties, Georgia.

This Club was organized February 17, 1854. Its present number of members is 64. The initiation fee is $1, and each member also pays a like sum, per annum, together with voluntary contributions. We hold a Fair once a year, when about $300 are expended for premiums, the largest we have ever offered being $25, for the best trained trotting horse.

Our Club has aroused a spirit of inquiry as to stock-rearing and the improvement of crops, which has resulted in decided benefit to both.

Illinois State Agricultural Society.

This Society was organized and chartered in January, 1853. Each member pays an initiation fee of $1, and an equal sum annually. Any member, for this payment, is entitled to make as many entries for exhibition as he may please. Our treasury contains $300. A Fair is held yearly; and sometimes, distinct from this exhibition, we have trials of agricultural implements and machines. About $10,000 are paid for premiums at the regular shows, the largest ever offered having been $5,000 for a steam-engine that will do all the work of a farm. We have paid $500, per annum, for experiments. For cuttings and seeds, we expended, in 1856, $100. Our transactions are published biennially by the State. We have but a few books, scarcely to be called a library.

It can be justly claimed that our Society has introduced fine stock, and caused it to be distributed over the State; that we have effected a more general diffusion of agricultural knowledge, improved cultivation, an elevation of the masses, and an exhibition of a desire to progress.

Adam County Agricultural and Mechanical Association, Illinois.

Organized October 29, 1853, and chartered in the same year. Our Association has now about 800 members, paying an initiation fee of $1 each, and an equal sum per annum. From the Fairs, which are annual, and rent of ground, we obtain further funds. About $1,200 are expended for premiums at an exhibition, the largest, in agriculture, being $15 for stock, and, in the mechanical division, $20 for steam-engines, &c. Our reports, essays, &c., are published in the State Society's Transactions. We have just commenced the formation of a library.

Improvement is plainly visible, particularly in horses and cattle, and in the use of agricultural machinery.

Clay County Agricultural Society, Illinois.

The date of our organization was February 7, 1857, and we have at present about 250 members. An initiation fee of $1 is required, and an equal sum annually, although this year, many members paid $10 each as private subscription towards fencing the grounds and sinking wells. For life membership, there is a charge of $10. Our other modes of obtaining funds are from admittance fees to the exhibitions, and the aid we derive from State appropriations; the latter, however, will cease this year. In real estate, we possess 2 acres of land, fenced and furnished with wells, as above mentioned, and other conveniences for the Society. In cash, we have about $100. An annual Fair is held, when $300 are paid for premiums, the largest being $10 for cattle. For a lecture, delivered before us on the first day of our recent exhibition, we gave $5. Our transactions are published annually in the volume with those of the State Society.

The greatest benefit resulting from our Society has been the introduction of thorough-bred Durham bulls. At the first Fair, there was but one in the county; at the second, there were seven, of different ages. Chinese sugar-cane, the seed of which was sent from the Patent Office, we consider a great benefit; also the seed of small grains, from the same source.

Our farmers desire to improve, and are at work for the purpose.

Clinton County Agricultural and Mechanical Society, Illinois.

The date of our organization was June 16, 1856, under a general act of the Legislature. We have both annual and life members, the number of the latter being 82. Those by the year pay $1, while a payment of $15 is required for life membership. Our other modes of obtaining funds are from the charges at our gates during exhibitions,

and from fees for entering articles; annual members paying 25 per cent. on the premium offered, and persons not belonging to the Society 50 per cent. We hold a Fair once a year, at which the average amount of premiums is $450, the largest being $10 for the best horse; $10 for the best mule; $10 for the best bull; $10 for the best cow; and $10 for the greatest and best variety of animals and articles.

Our transactions are published annually in the county paper.

Since the organization of this Society, the farmers till the ground better, and consequently the crops are improved. We plant more orchards, and shade trees; and there is a spirit of emulation among us, which is fast changing the face of the country.

Cumberland County Agricultural Society, Illinois.

This Society was organized February, 1857. The present number of members is 192, each paying an initiation fee of $1, and an equal sum annually; or $10 for life. The State appropriates $100 yearly. We have on hand $120. An annual Fair is held, when about $250 are awarded as premiums, the largest being $8 for the best essay on prairie farming.

A great desire is manifested for the improvement of domestic animals, as well as to enhance the value and beauty of our farms. The seeds distributed by the Patent Office are sought for with avidity, and much care is taken to give them a fair trial.

Fayette Agricultural and Mechanical Association, Fayette county, Illinois.

Organized March 14, 1857. This Association, at present, contains about 300 members, each paying $1 initiation fee, and an equal sum annually; or $5 for life membership. The proceeds of Fairs furnish additional funds. We own grounds valued at $2,000, where our annual exhibitions are held, when from $500 to $1,000 are paid for premiums, the largest being $25 for horses. Our transactions are published with those of the State Society.

The increased interest felt in the acquisition of agricultural knowledge is already perceptible. An effort is being made to improve the different breeds of animals. Experiments in various kinds of crops have been tried.

Fulton County Agricultural Society, Illinois.

The date of our organization was November 6, 1851. Our present number of members is about 500, each paying $1 initiation fee, and an equal sum annually; or $15 for life. Admission fees, of 25 cents each, to our Fairs, further increase the funds. We hold a lease at will on 20 acres of land, used for exhibitions, and valued at $1,000,

our improvements on which are worth $1,100; and we have, in cash, $100. A Fair is opened yearly, when from $500 to $700 are paid for premiums. The highest offered has been $10, and this sum has been awarded for the best draught stallion; for the best blooded stallion; for the best Durham bull; for the best French or Spanish sheep; for the best wheat on from 3 to 10 acres; for the best reaper and mower; and for the best thresher. Thus far, we have only paid the personal expenses of a lecturer. Our library contains one hundred and thirty-eight volumes, valued at about $75.

The improvement in horses, cattle, sheep, and swine has been great; and there is a general increase of interest as to all agricultural affairs.

Green County Agricultural and Mechanical Society, Illinois.

This Society was organized in 1854, and chartered in 1856. Stockholders in the Fair grounds, of whom there are 127, are life members; and we have, besides, about 300 annual members. The former class pay $10; the latter, $1 initiation fee, and a like amount, each, per annum. Our other modes of obtaining funds are a charge of 10 per cent. on the premium contended for, by any animal or article; and gate fees for admission. We possess 5 acres of land, inclosed, and furnished with buildings for exhibitions. One is held annually, when about $500 are offered as prizes, the largest being $10, each, for horses, cattle, field crops of wheat, corn, oats, syrup from Chinese sugar-cane, plan of a barn, and a method of raising water for stock.

A laudable spirit of emulation has been excited in all departments of agriculture and horticulture, as well as in the improvement of implements. Premiums have been awarded on a crop of oats of over 110 bushels to the acre, and on a crop of wheat of over 40 bushels per acre. The introduction of the Black Hawk, Flying Cloud, Live Oak, George, Champion Black Hawk, St. Lawrence, and Quebec, the two latter from Canada, has greatly improved our horses. But as to cattle, a still more favorable change is perceptible, some of the finest specimens of the Durham breed being now reared in this county.

Grundy County Agricultural and Horticultural Society, Illinois.

Organized March 6, 1858. Our present number of members is 480, of whom 100 are for life. An annual amount of $1, each, is paid by the members; and those for life pay $10. An appropriation is made by the State of $100 per annum for our benefit. We at present possess $100 in cash, and a twenty-year lease of grounds, fenced and improved, on which $1,600 have lately been expended. The amount paid for premiums, this year, was $450, the largest being $10 for the fastest trotting horse, $6 for the best stallion, and an equal sum for the best bull.

The community has a high appreciation of the efforts of our Society, and we will soon, no doubt, be able to make a favorable report of the benefits arising therefrom.

Hancock County Agricultural Society, Illinois.

This Society was organized January 10, 1852, under a general law of the State. The present number of members is 200, each paying $1 initiation fee, and an equal sum yearly. Entry charges to grounds and voluntary contributions form our additional funds. We possess a lease of 20 acres of land. An annual Fair is held, when $400 are awarded as premiums, the largest being $10 for cattle and horses. A Report of the proceedings of each exhibition is published, consisting of sixteen pages, and five hundred copies.

There is a perceptible improvement in the breeding of neat cattle, induced by our shows; and an increasing interest in relation to agricultural affairs generally.

Henry County Agricultural Society, Illinois.

This Society was organized under a general "Act for the Incorporation of Agricultural Societies" in September, 1852. We have about 500 annual and 100 life members, the former paying $1 yearly, each, and the latter, a fee of $10. The Legislature appropriates for our benefit $100 per annum. Our Fair grounds of 20 acres, with buildings, are valued at $2,500. Here we hold an annual exhibition, paying for premiums from $800 to $1,000, the largest of which has been $10 for the best horse. We have an address each year, for which we pay. Our transactions are published in the county newspapers. The library of our Society consists of two hundred volumes, valued at $200.

In consequence of our efforts, horses, cattle, swine, sheep, &c., have so improved as to add at least 25 per cent. to the value of the live stock of the county. Among the seeds from the Patent Office, we have found those of garden vegetables most valuable.

Iroquois County Agricultural Society, Illinois.

This Society was organized and chartered in 1853. The present number of members is 300, each paying an initiation fee of $1, and an equal sum yearly; or $10 for life. An annual Fair is held, when about $400 are awarded as premiums, the largest being $10 for the best cultivated farm; and $5, each, for the best stallion, bull, brood mare, and cow.

Since our first Fair, agriculture has steadily advanced, and each exhibition gives it renewed energy.

Jasper County Agricultural Society, Illinois.

This Society was organized April 3, 1858. Its present number of members is 225, each paying an initiation fee of $1, and an equal sum annually. Grounds have been granted to us, for an indefinite period, free of charge, which we have inclosed at our own expense. A yearly Fair is held, when $200 are awarded as premiums, the largest being $10 for the best cultivated farm.

Much interest is felt in the Society, and sanguine expectations are expressed with regard to future benefits.

Farmers' Club, District 2d, Thompson township, Jo Daviess county, Illinois.

Our Club was organized March 27, 1858, and has 13 members, each paying $1 50 at initiation. Voluntary contributions supply additional funds. It is our intention to hold a Fair annually. Our library contains fourteen volumes, valued at $25.

The benefits already resulting from our Club are—a general stimulus to action, and a steady aim to improve stock.

Kankakee County Agricultural Society, Illinois.

Under a law of the State, this Society was organized December 14, 1855. It now contains 400 members, each paying $1 at initiation, and an equal sum annually; or $15 for life membership. We own 12 acres of land, suitably fenced and improved, where an annual Fair is held, when about $700 are paid for premiums, the largest being $25 for a thorough-bred stallion.

Much interest is felt in the county on the subject of agriculture, which will doubtless be productive of good.

Knox County Agricultural Society, Illinois.

This Society was organized about 1840, suspended in 1842, and revived June 4, 1853. Its present number of members is 535, each paying $1 a year. A payment of $10 is required for the privilege of life membership. From the charges for refectories on the Fair ground, and the sale of grass from the same land, we obtain further funds. This place contains 10 acres, with buildings, and here our annual exhibitions are held, when amounts, varying in different years, have

been expended for premiums. In 1857, the sum was $600, and in 1858, $928. The largest of these awards ever offered was $10 and diploma for the best thorough-bred horse.

Since the re-formation of the Society, in 1853, there has been a large increase in the number of thorough-bred horses and cattle, particularly of the latter, and fine sheep. Attention has been directed to more careful culture. Agricultural publications have been more generally read, and the mechanical and fine arts have been stimulated. The more general acquaintance of farmers among themselves, producing a better understanding and appreciation of each other, has developed a disposition to excel rather as a community, than as individuals.

Lake County Agricultural and Horticultural Society, Illinois.

The date of our organization was October 25, 1851, and our present number of members is 200, each paying $1 initiation fee, and a like sum annually. Admissions to the Fair, at 25 cents each, contribute to our funds. We hold a lease of 10 acres of land, inclosed, for purposes of exhibition. A Fair takes place yearly, when about $400 are expended for premiums, the largest of which, from $5 to $10, were awarded for the best farm and the best stud horse.

The principal benefits of our Society are derived from the Fairs, exhibitions, and the social intercourse of those occasions. Our Fairs continue two days.

La Salle County Agricultural, Horticultural and Industrial Society, Illinois.

Organized December 2, 1852. This Society contains at present 448 members, each paying $1 initiation fee, and an equal amount annually. We have received $100 per annum from the State for the last two years. Our grounds, embracing 10 acres, are held on a perpetual lease, and are furnished with proper buildings. Here we have an annual Fair, when about $500 are paid for premiums, of which the largest were $10, each, for Devon cattle and agricultural implements; and $8 for a stallion. Our library has seventy-five volumes, valued at $125.

A greater number of agricultural periodicals are now read, a more enlightened system of farming pursued, and a marked improvement is visible in stock, particularly in horses and cattle; at the same time, more and better implements are used, and the best quality and varieties of seeds sought for.

Lee County Agricultural Society, Illinois.

This Society was organized July 14, 1858, and contains 541 mem bers, each paying $1 initiation fee, and an equal amount annually; or

$10 for life membership. We obtain other funds by subscription. A Fair is held yearly. At the last exhibition, $850 were paid for premiums, the largest being $50 for the best trotting stallion.

Our breeds of horses and cattle are improving; the recent display was the best ever seen at a county Fair. Agricultural products, sheep, fowls, and household utensils also gave evidence of our progress.

Logan County Agricultural Society, Illinois.

This Society was organized June 16, 1856, chartered February 1, 1857, and at present contains 33 members. Each of these pays an initiation fee of $1, and an equal sum annually.

Chartered upon the joint-stock principle, shares in this Society, at $1 each, are taken by the members, with the privilege of increasing them to $100. In this manner, shares to the amount of $2,000 are now held by the members.

We at present possess 10 acres of real estate, improved and fitted up for exhibitions, and valued at $1,500; together with an unappropriated fund of $400. A Fair is held annually, when about $1,000 are paid for premiums, the largest being $20 for fine specimens of horses and cattle. We also give awards, varying from $10 to $20, for grains, vegetables, and dairy products. In all, we have expended $50 for cuttings and seeds for distribution. An annual Report of our transactions is made to the State Society and published in its volume. We have just commenced forming a library, but for want of funds have only a few books. By an article in our constitution the Secretary is authorized to receive, by donation, or required to obtain by purchase, when the funds may justify, suitable books, and to take care of the same for the benefit of the Society; also to receive and distribute seeds.

Since the organization of our Society, there has been a decided improvement in all kinds of stock, owing to the introduction of better breeds and attention on scientific principles. The competition caused by the three Fairs, already held, has produced a generous rivalry among our farmers as to the most valuable stock of all kinds. With farm and vegetable products, a similar improvement is seen, new modes of culture, rare seeds, and labor-saving machinery having been introduced. A regular system of rotation of crops, which was sadly wanted here, has also been adopted by our more enterprising farmers. Agricultural and horticultural books and papers are more extensively read. Finally, it is the opinion that our Society has done more for the diffusion of agricultural knowledge throughout our county, by means of its Fairs and meetings, than could have been effected in any other way in ten years.

Macon County Agricultural Society, Illinois.

This Society was organized in 1856, under a general law of the State, and now contains 183 members, who become stockholders by

paying $5 a share. These members pay admission charges at the Fairs in the same manner as other persons, but are entitled to 20 per cent. in entrance fees on the stock invested. Our other modes of obtaining funds are by gate and entrance payments, licenses for restaurants, &c. We at present possess $1,200. An annual Fair is held, when from $500 to $600 are awarded as premiums, the largest being $15 for long-lived horses, asses, and cattle. We generally select an individual from our own Society to deliver an address at the Fair, and this service is gratuitous. Yearly statements of our transactions are made at the stockholders' meetings.

Benefits have resulted from our organization by giving all an opportunity of seeing and experimenting with new and important labor-saving machinery; by encouraging competition among manufacturers; an interchange of ideas and opinions among farmers; and by enabling stock-growers to compare their animals, and learn their points of merit. Our Fairs have been productive of good effects.

Mason County Agricultural Society, Illinois.

Our Society was organized January 14, 1854, and we now have 300 members, paying an initiation fee of $1 each, and an equal sum annually; or $10 for life membership. We also obtain funds by admission fees to our exhibitions, being 25 cents for each person, members excepted.

A Fair ground, of 5 acres, is our only property at present. There is generally a surplus fund on hand, but this year we expended it for improvements. An annual exhibition is held, when about $400 are paid for premiums, the largest of which have been $10, each, for the best stallion, brood mare, bull, cow, &c. We have only a few volumes in our library, but are endeavoring to enlarge it.

There has been a marked improvement in the domestic animals of this county.

McDonough County Agricultural Society, Illinois.

The date of our organization was June, 1854. At present, we have 500 members, each paying an initiation fee of $1, and a like sum annually. The amount required for life membership is $10. Our other modes of obtaining funds are by a charge at the exhibition gates, and the annual receipt of $100 from the State Treasury. We possess $1,000 worth of improvements on rented grounds. A Fair is held once a year, when about $500 are paid for premiums, the largest being $10, for cultivated timber.

There has been a great improvement n domestic animals, resulting from the efforts of our Society.

Menard County Agricultural Society, Illinois.

This Society was organized June 24, 1854, and at present contains 1,000 members, each paying $1 initiation fee, and an equal amount yearly; or $10 for life. Additional funds are obtained by gate fees and entrances. We possess grounds and improvements valued at $2,500. An annual Fair is held, when about $1,000 are awarded as premiums, the largest being $50 for the best herd of cattle, consisting of a bull and five cows, and an equal sum for the best roadster stallion. This county is peculiarly adapted to the rearing of stock, to which pursuit, therefore, all possible encouragement is given. There is but little more small grain raised here than is required for the making of bread. As we have no railroad communication, roadster horses are of the greatest utility to the agricultural community. Our proceedings are not published with regularity, but such papers as may be considered valuable are printed as occasion demands. We have a library of twelve hundred volumes.

At the organization of the Society, there was not a thorough-bred domestic animal in the county; but since then, many have been introduced. One of the herds (consisting of a bull and five cows) exhibited at the last Fair, was valued at $10,000. Nothing is required to increase the crops, the soil, naturally prolific, only demanding that the seed be sown, when an abundant harvest will surely follow. Garden products have been greatly improved through the agency of the Patent Office. The seeds of the Chinese sugar-cane, furnished us a few years ago, are effecting an agricultural revolution. Thus far, the culture has proved the reality of our experiments; we believe that the time is at hand when we shall have within ourselves another resource of sustenance and profit. Menard responds to the general voice of Illinois, and of the West, in vindication of the agricultural branch of the Patent Office.

Mercer County Agricultural Society, Illinois.

This Society was organized January, 1854, under a general law. The present number of members is 600, each paying an initiation fee of $1, and an equal sum yearly; or $10 for life. Further funds are obtained by subscriptions and charges for admission to the grounds. We possess 5 acres of land. A Fair is held annually, when from $400 to $500 are awarded as premiums, the largest being $15 for the best farm, and $10 for bulls and stallions.

The benefits of this organization are—the bringing farmers together that all may learn what each can do in developing our rich soil; furnishing information as to the best animals, seeds and plants, and where they may be obtained; the opportunity to examine and test farm machinery; and awakening emulation to succeed in everything best.

Montgomery County Agricultural Society, Illinois.

This Society was organized July 3, 1857, and chartered in 1855. Its present number of members is 100, each paying an initiation fee of $1, and an equal sum per annum. The annual donation from the State of $100, and the admission fees at the gate during exhibitions, are our other modes of obtaining funds. We possess a Fair ground of 5 acres, inclosed with a good fence, and supplied with the proper buildings, all worth $2,000. Here a Fair is held annually, when about $1,000 are expended for premiums, the largest being of $20 and $15 for the best cattle and horses.

Our lectures are generally free, but when persons from a distance deliver them, we pay their expenses amounting to from $10 to $25.

The only apparent benefit thus far resulting from our Society has been the improvement of domestic animals by the introduction of good blood.

Morgan County Agricultural Society, Illinois.

This Society was organized September, 1851, under a general law of the State. The present number of members is 1,000, each paying an initiation fee of $1, and an equal sum per annum. Entry and gate charges further increase our funds. We possess 30 acres of land, valued at $10,000. An annual Fair is held, when the amount awarded as premiums varies, but has been $1,600, the largest of $50, for horses.

Our influence in behalf of education has been incidental, but decided, as more farmers' sons are now at school than formerly. Our stock of horses, cattle, sheep, and swine compare favorably with older States. A better system of tillage is also employed, and an increase of crops has been the consequence.

Moultrie County Agricultural Society, Illinois.

This Society was organized May, 1858, under a general law. The present number of members is about 150, each paying an initiation fee of $1, and an equal amount per annum. In 1858, we received $100 from the State. We are permitted to use 6 acres of ground for Fairs, which are to be held annually. At the last, $150 were awarded as premiums, the largest being $5 for various kinds of horses. The transactions of our Society are published from time to time in the county paper.

The farmers and other citizens of the vicinity take a lively interest in the enterprise.

Pike County Agricultural Society, Illinois.

This Society was organized in 1850, and incorporated under an act of the Legislature three or four years since. We have about 500 members, each paying an initiation fee of $1, and an equal sum annually. The amount required for life membership is $25. For the past two years, the State has appropriated $100 per annum to our Society. Other funds are derived from gate and entrance fees, and sales of booth and restaurant licenses on Fair grounds. We possess 12 acres of land, inclosed with a board fence 8 feet high, and valued at $2,500. Here we hold an annual Fair, when from $300 to $500 are paid for premiums, the largest being $15 for the best lot of cattle at least five in number.

The influence of our Society upon the husbandry of the county has been very great. A spirit of emulation is abroad, a pride in the calling, a desire to possess improved breeds of animals, to obtain the largest returns for labor, and to secure well-tilled farms, good fences, and comfortable homes. Crops are more certain, and the increase, per acre, is generally greater than before. At our last Fair, as fine cattle as the State can produce were exhibited, together with some imported from England. Every branch of husbandry also bore witness in its fruits to the care bestowed.

Buel Institute, Putnam county, Illinois.

This Institute was organized March 18, 1846, and chartered February 9, 1855. Its present number of members is about 400, each of whom pays an initiation fee of $1, and an equal sum annually. Our other modes of obtaining funds are by the sale of tickets of admittance to the Fair grounds, and the receipt of $100 per annum from the State. We hold a Fair yearly, when from $400 to $550 are expended for premiums, the largest being $25 for the best improved and cultivated farm, including buildings and other appurtenances. We have awarded $10 for the best bull, and $12 for the best stallion. Nothing has been paid to lecturers except their travelling expenses.

The operations of this Institute have resulted in a marked improvement of almost everything connected with our agriculture, particularly the rearing of domestic animals. A great good has also been accomplished by the introduction of better implements.

Randolph County Agricultural Society, Illinois.

This Society was organized January 9, 1852. Its present number of members is 500. At first, the initiation fee was 25 cents, but recently the annual payment of 50 cents each constitutes membership. Donations and admission fees at Fairs are our further modes of obtain-

ing funds. We possess 10 acres of land, worth $500, and improvements thereon, worth $1,200. Here, in September or October, our Fair is held, when from $300 to $500 are expended for premiums. Agricultural books are also awarded. The largest prizes offered have been $10 for stallions; from $6 to $10 for stallions of different ages and breeds; and from $4 to $8 for Durham and other improved bulls. We have an agricultural address at the Fairs, for which we sometimes pay. Our transactions are reported to the secretary of the State Society, and published in its biennial volume.

In that part of the county where most of our members reside may be particularly remarked the diffusion of agricultural knowledge, the improvement of domestic animals, and the increase of crops. Previous to our organization, there were no improved stock; now Durhams and Devons, &c., are common. The average crop of wheat, per acre, was from 10 to 12 bushels; at present it is over 20 bushels. Agricultural periodicals from many States of the Union are received by us, and, as the postmaster informs us, the number of newspapers and pamphlets arriving weekly at his office is about eighteen hundred.

Rock Island Society for the Promotion of Agriculture and the Mechanic Arts, Rock Island county, Illinois.

This Society was organized in 1853. Each member pays an initiation fee of $1, and an equal sum annually. Our additional funds are derived from admission fees, and an appropriation of $100 from the State. We have the use of 10 acres of land for exhibitions. An annual Fair is held, when from $250 to $375 are paid for premiums, the largest of which have been $10 for the best horse, $8 on cattle, and $10 each on 4 acres of wheat and the same quantity of corn. Our transactions are reported to the State Society.

Sangamon County Agricultural and Mechanical Association, Illinois.

This Society was organized October 7, 1852, and chartered February 11, 1853. The present number of members is 33, all of whom are stockholders. Entry fees on articles for exhibition and admission charges at the gate add to the funds. We possess $5,000. An annual Fair is held, when from $1,100 to $1,200 are awarded as premiums, the largest being $20 for the best thorough-bred stallions and bulls. Our transactions are published biennially by the State Society.

Great benefits have resulted in the increase of farm products and the improvement of animals.

Tazewell County Agricultural Society, Illinois.

Organized March 1, 1850, and chartered February 9, 1853. This Society has now 211 members, each paying $1 initiation fee, and an equal sum annually; besides which, we have an income from the sale of tickets of admission to our Fairs, and a donation of $100 per annum from the State. Our treasury contains $200. We have rented 12 acres of ground for fifteen years, and inclosed it with a picket fence. Here we have a business office, and a large tent for exhibitions. An annual Fair is held. Last year, we paid for premiums $360 in money, and $40 worth of books. The largest amount ever offered in one year was $700. As yet, we have paid nothing for lectures except the travelling expenses of the lecturer, if from a distance. A report of our transactions is sent to the State Society, and subsequently embraced in its volume. Our library consists of twenty volumes of the Patent Office Reports.

Much good has been produced by way of improvement in domestic animals, implements, and the increase of crops.

Vermilion County Agricultural Society, Illinois.

This Society was organized May, 1851, and chartered July, 1855. The present number of members is 300, each paying $1 initiation fee, and an equal sum per annum; or $25 for life. Charges for admission to the Fairs increase our funds. We have a lease on 8 acres of land, inclosed. An annual Fair is held, when $1,000 are awarded as premiums, the largest being for thorough-bred horses and cattle, and for fast-trotting and pacing horses. Our transactions are published by the State Society.

Great improvement has taken place in stock-rearing and farming. Many of the seeds received from the Patent Office have proved valuable.

Wayne County Agricultural Society, Illinois.

Organized July 4, 1855. This Society now contains 120 members, paying $1 each at initiation and an equal sum annually. Our funds are further increased by donations and $100 a year from the State. We possess real estate valued at $500. An annual Fair is held, at which about $200 are paid for premiums, the largest being $5 for the best three yoke of oxen. Our prize list is published in the county paper.

There is much competition among us in the improvement of various breeds of domestic animals, in procuring the best implements, and in the proper cultivation of crops of grains, vegetables, and fruits.

Whiteside County Agricultural Society, Illinois.

Under the general law of the State, our Society was organized in February, 1856, and at present numbers 200 members. The amount of initiation fee is $1, and the annual payment thereafter of a similar sum. We hold a Fair each year, when about $800 are paid for premiums. The largest ever offered by us was $5, for the best horses and cattle. For lectures, we pay about $50 per annum.

Our Society has introduced into this county some Durham and Devon cattle, Morgan, Black Hawk, and other fine breeds of horses, as well as improved sheep and swine. The manufacture of agricultural implements has also been promoted.

Will County Agricultural Society, Illinois.

The date of our organization was September 12, 1851. Members, being only yearly, vary in number, but at present are 600, each paying $1 per annum. We obtain further funds from payments made on the entry of articles for competition, from fees for admission to the Fairs, and from donations. In 1857, we received a donation, ($500,) and last year the county and city of Joliet gave us $250 each. Our grounds are leased for a term of years, and are inclosed by a high board fence. We hold an annual exhibition, at the last of which about $1,400 were offered as premiums, but only $900 paid out. The season not being favorable for farming, many of the prizes were not competed for. We have given a premium as large as $30, for the best cultivated farm of 160 acres. The proceedings of our annual meetings, together with a list of prizes, are published, each year, in the county newspapers.

After many discouragements, owing principally to the fluctuations of our population, we can now safely say that our Society is established. The farmers appreciate it. A great improvement is evident in crops and stock. We have some of the best breeds of horses, and as good cattle and sheep as can be found in the State. Our farmers annually receive a large number of premiums from the State Agricultural Society.

Woodford County Agricultural Society, Illinois.

This Society was organized and chartered under the provisions of the Legislature, May 29, 1858, with a capital of $40,000 divided into shares of $1 each. The present number of members is 110, and the amount of initiation fee is one share or more, each person remaining a member so long as he shall own one share, at least. No annual payment is required. We collect entrance and gate fees from exhibitors and others. From the State, we have received a donation of $100, and from entrance and gate fees $335. We possess 10 acres of land

inclosed by a post and plank fence 7 feet high. We hold an annual Fair. The last was opened in 1858, when the premiums offered were small, being in cash $145 50—the rest in diplomas. The largest of these awards were, $3, each, for the best stallion and bull.

At our late exhibition, more interest was manifested by the citizens of the county than ever before, about 1,000 persons attending, and the number of entries, particularly of live stock, being highly creditable.

Boone County Agricultural Society, Indiana.

This Society was organized February 22, 1853, and chartered May 7, 1852. The present number of members is 329, each paying an initiation fee of $1, and an equal sum per annum. Admissions to the Fairs further increase our income. We possess about $500 in cash, and $400 in fixtures on the grounds. A Fair is held yearly, when from $300 to $500 are awarded as premiums, the largest being $20 and $10 for the best cultivated farm, best horses, best cattle, plans for houses and barns, for draining lands, and for youths' equestrianship. We publish annually a prize list and such communications as may be deemed appropriate.

At the organization of the Society, there were no thorough-bred cattle in the county; now there are many, and crosses with the common stock. Crops also have been increased by superior culture. Conversations and discussions growing out of our exhibitions, as well as the force of example, encourage industry, dignify labor, and improve the taste.

Dearborn County Agricultural Society, Indiana.

This Society was organized April 10, 1852, and has at present 800 members, each paying an initiation fee of $1, and an equal sum yearly. Admission charges to exhibitions increase our funds. An annual Fair is held, when $950 are awarded as premiums, the largest being $25 for the best essay on farms and their products. We pay $10 per annum for an address. Our transactions are published in the county papers.

There has been a marked improvement in horses, cattle, sheep, and swine; also in domestic manufactures.

Floyd County Agricultural and Mechanical Association, Indiana.

This Association was organized February, 1858, under a general law of the State. The present number of members is 455, each

paying $5 per annum until a share is paid for, being $25. No person is permitted to take more than one share on original subscription. Our funds are increased by the proceeds of Fairs, booth rents, and entry fees. We possess 62 acres of land, well adapted for a Fair ground. Our exhibitions are held twice a year, the first being for equestrian purposes, and the second a general display of agricultural products. We have paid $1,600 for premiums. The State Society publishes our proceedings in the annual volume containing its own. Though inconsiderable at present, our library is augmenting rapidly.

Our county is the smallest in the State; but not only the citizens of Floyd, but of the surrounding counties, have liberally taken stock, and are interested in our project. From 8,000 to 10,000 people daily attended our late Fair, and the stock (especially horses) was equal to any in the West. The trial course is a mile in circumference, and of easy grade, nearly level. The ground is under-drained with tiles, and we have a show circle 360 feet in diameter.

Greene County Agricultural Society, Indiana.

Under the act of the Legislature, this Society was organized November 14, 1853, and now numbers 225 members. Each pays an initiation fee of $1, and an equal sum annually. We have leased 4 acres of land for ten years, where we hold a Fair once a year. The largest premiums offered were $15 for female equestrianship, and $10 each for the best Short-horned bull, cow of the same breed, and trotting and pacing horse or mare, with others, varying from $5 to $25, for grain, &c.

The benefits resulting from our Society have been—ambition for the best breeds of stock; an increase of the number of acres cultivated; an improvement in manuring; the introduction of useful agricultural implements; and more attention to the conveniences of farm buildings.

Henry County Agricultural Society, Indiana.

This Society was organized in 1851. Each member pays $1 initiation fee, and an equal sum annually. We have no other mode of obtaining funds, except certain privileges of exhibition. Our treasury contains only a small excess of receipts beyond the premiums. A Fair is held yearly, when from $600 to $800 are awarded as prizes, the largest being $10 for horses, cattle, and swine. Lectures have been delivered before us gratuitously, until the last, for which we paid $15.

The benefits resulting from our Society are most satisfactory, both in the cultivation of farms and the condition of live stock.

Jay County Agricultural Society, Indiana.

This Society was organized June 1, 1853, under a general law. The present number of members is about 100, each paying an initiation fee of $1, and an equal sum yearly. We receive all money paid in the county for show licenses, and also charge for admission to the grounds. An annual Fair is held, when from $100 to $125 are awarded as premiums, the largest being $5, each, for the best stallion and best acre of wheat and corn.

A general reform in agriculture has resulted. Farmers are induced to import stock of all kinds, and are taught to know and use the best seeds.

Jefferson County Agricultural Society, Indiana.

This Society was organized June, 1852, under a general law of the State. The present number of members is about 100. We formerly issued certificates of membership for two, five, and twelve years, at $3, $5, and $10, respectively, but have discontinued this system, depending now on the per-centage derived from entries, which is generally 10 per cent. of the premium competed for. In real estate, with improvements, we possess about $6,000 worth. We hold two Fairs a year, one being for live stock, and the other for general agricultural purposes. About $2,000 are paid annually for premiums. The largest offered is $50 for the best improved and cultivated farm. Our proceedings are published yearly in the volume of the State Board.

Every branch of our industry has materially improved since the organization of this Society. The quantity of products has increased 100 per cent., the quality being also far better; and the breed and superiority of stock have far exceeded this estimate. In the horticultural department, the greatest change has occurred, for when the Society was organized, there was but little fruit in the county, while now we can compare favorably with the old fruit-growing districts. We possess 20 acres of ground.

Jennings County Agricultural Society, Indiana.

This Society was organized March, 1853, under a general law of the State. The present number of members is 260, each paying an initiation fee of $1, and an equal sum annually. Admission charges at the gate, per-centage on entrances and booth privileges, furnish additional funds. We have a lease for ten years on our present Fair grounds. An exhibition is held yearly, when about $375 are awarded as premiums, the largest being $20, each, for the best stallion for general purposes; the fastest pacer; and the fastest trotter.

Our transactions are communicated annually to the State Board, by which they are published. We have a library of about one hundred and fifty volumes, worth $300.

There has been a marked improvement in the live stock of this county, chiefly owing to the introduction of animals from Kentucky. Orchards, also, are better. Ten thousand dollars' worth of trees have been imported within the past year. All the labor-saving machines, which in former times were scoffed at, are now in general use upon our farms. The Society can justly claim the merit of having effected the greater part of this improvement.

Greenwood Farmers' and Mechanics' Club, Johnson county, Indiana.

The date of our organization was May 16, 1857; and we have at present 32 members. Each of these pays 25 cents initiation fee, and a like sum annually, while another mode of obtaining funds is by taxation. A Fair is held annually, at which each exhibitor is required to pay a stated fee for entering an article in any specified division, and the aggregate of each division constitutes its premium. No certain amount is appropriated for instruction; our lectures having been thus far gratuitous, the Club paying only travelling expenses.

It is certain that a spirit of inquiry has been engendered among the members; they look more minutely into the causes and effects of things transpiring around them. A large proportion have become constant readers of one or more agricultural papers, besides works on special topics of like nature. Moreover, we are better contented with our occupation, and find it elevated in our own estimation.

Little improvement is yet visible in stock, though there seems to be a firm determination to accomplish much. There has been a decided increase of the crops. We plough deeper, cultivate better, and strive to excel.

Our Club simply embraces the neighborhood, to benefit ourselves and those who may choose to associate with us. We meet on the third Saturday of each month, and have standing committees upon the different and most important subjects, one or two of which are designated to report at a succeeding meeting. These subjects are then open for general discussion.

A Fair is held in the fall, open to every one, whether member or not. At the first, there were one hundred and ninety-seven entries, and at the second, three hundred and forty-eight; which we regard as doing well for a small neighborhood.

Knox County Agricultural Society, Indiana.

The date of our organization was August, 1851. We act under a general charter of the State. At present, we have about 200 members,

each of whom pays $1 initiation fee, and an equal sum per annum. The county funds from shows, and gate fees at Fairs, constitute our other means of obtaining money. We possess about the value of $1,000 in buildings and fences, and are taking steps to purchase 20 acres of ground for $1,500. We hold a Fair annually, at which from $200 to $1,000 are paid for premiums, the largest ever offered being from $15 to $20, for horses and cattle.

The transactions of the County Societies are published annually by the State Board, when the proper data are supplied them.

We have no library, but all the books we receive are distributed as premiums, which enhances their value and diffuses much useful information.

The improved appearance of the farms; the manuring of the soil and alternating of the crops; the supplanting of the log cabin by large and comfortable farm houses of frame or brick; and the general thrift and good cheer pervading the community, are evidences of the influence of our Society. The merchant can now collect his dues with comparative ease; farmers and mechanics experience a strong desire to educate their sons and daughters, and fit them for the active duties of life. In this manner is exhibited a renovated social state. The benefits to stock, and the increased yield of crops, may be ascertained by comparing their maximum with former years. It has risen, as to swine, from 200 or 300 to 500 or 600 pounds; cattle, from 500 or 600 to 1,000 or 1,500 pounds; corn, from 50 to 60 bushels per acre to 100 and 130 bushels; wheat, from 20 or 25 to 30 or 40 bushels; and other products in proportion.

Kosciusko County Agricultural Society, Indiana.

This Society was organized in 1853, under a general law. The present number of members is 162, each paying an initiation fee of $1, and an equal sum yearly; or $10 for life. We obtain further funds by charges for admission to the grounds. In real estate, we own 6 acres, worth $1,000. A Fair is held annually, when from $200 to $400 are awarded as premiums, the largest being $4 and $5 for the best stallion and best acre of wheat. The highest prizes are usually bestowed on stock. The State publishes our transactions annually.

A spirit of emulation has been infused among members, caused by the efforts of this Society. The breeds of horses, cattle, sheep, and swine exhibit great improvement. We have also been enabled to introduce many new and superior varieties of grain, seeds, and vegetables, through the favor of the Patent Office.

Lake County Agricultural Society, Indiana.

This Society was organized August 27, 1851. Its present number of members is about 80. An initiation fee of $1 constitutes member-

ship, to which payments are added the sums received from the licenses of showmen. Our only real estate is 4 acres of ground for Fairs, which are held annually. At such times, about $125 are paid in premiums, the largest being $3.

Our country is new, and the inhabitants are not wealthy, yet the Society is doing a good work, and interesting the farmers in improved agriculture. There is no better Fair ground in the State than ours, on which we have erected an agricultural hall, worth about $600.

Lawrence County Agricultural Society, Indiana.

Organized in 1851. This Society, at present, contains 150 members, each paying $1 initiation fee, and an equal sum annually. Our treasury possesses $2,500. Fairs are held twice a year. The amount paid for premiums is $600 per annum, $10 being the largest. We have a library of sixty volumes.

Much good has resulted from our Society, especially in the improvement of horses and cattle.

Marion County Agricultural Society, Indiana.

This Society was organized September 9, 1851, under a general law. The present number of members is about 500, each paying $1 per annum. Licenses for the exhibition of menageries, circuses, &c., furnish us with additional funds. An annual Fair is held, on the grounds of the State Society, when about $1,000 are awarded as premiums, the largest being $25 for the best cultivated farm. A Report of our transactions is transmitted each year to the State Society.

Increased interest is experienced in agriculture; and improvement is rapidly following.

Marshall County Agricultural Society, Indiana.

This Society was organized January 1, 1855, and at present contains 161 members, each paying $1 initiation fee, and an equal sum per annum. We obtain additional funds from the County Treasury, being the license charges collected from menageries and shows of all kinds; together with donations, entries at Fairs, licenses of peddlers, and entrance fees for trotting horses and equestrianship. We possess about 14 acres of land, 12 of which are fenced, the ground costing $500 and the inclosing and fitting up an equal sum. An annual Fair is held. In 1858, $248 were awarded as premiums, the largest offered being $10 for the best cultivated farm; $6, each, for the best stallion and bull; $4, each, for the best cultivated garden, best 4 acres of corn, best cultivated orchard, best wheat, best collection of apples, best brood mare, best cow, best half-dozen ewes, and best bee-manage-

ment; $3, each, for the best pair of farm horses, and best fine-woolled ram. Our transactions are published yearly in two newspapers in Plymouth.

An interest has been awakened among a few of our farmers to seek knowledge and turn their attention to experiments on a limited scale. The county is new, and in a natural state produces well. There are not many good agriculturists among us, and the majority are exhausting the fertility of their land. This is one of the evils which we propose to remedy. We have a fine stock-rearing country.

Miami County Agricultural Society, Indiana.

This Society was organized in 1854. Its present number of members is 500, each paying an initiation fee of $1. We receive from the County Treasury all moneys paid for licensing shows, &c. This sum, for 1858, was $240. We also have entrance fees, which amount to about $30 a year. Our treasury, at present, contains $200. An annual Fair is held, when about $350 are expended for premiums, the largest of which, $6, was awarded for cattle and horses. A full report of our transactions is made to the State Board.

At the time of our organization, there was no blooded stock in the county; but our annual exhibitions have excited emulation to possess the best of that kind, and our farmers are now purchasing such. Agricultural knowledge has been generally diffused, and we hear of many procuring the standard works on this subject.

Noble County Agricultural Society, Indiana.

Organized in January, 1857, and the constitution adopted at the same time. Our present number of members is 80, each of whom, at initiation, pays $1, and 50 cents, annually, thereafter. Licenses for shows, circuses, &c., together with such donations as may be offered, are our other modes of obtaining funds. We have now, in cash, $319, and in real estate, 5 acres, worth $1,000. An annual Fair is held. This year, we have not paid over $100 in premiums. The largest was $5 for the best acre of wheat, not less than 30 bushels to the acre; the same amount for corn, rye, &c. Our proceedings are only published in the county papers.

As to the benefits arising from our Society, we find an increased desire for information, and that more agricultural publications are taken. Improvement is manifest as to the condition of domestic animals. The crops are also better.

Owen County Agricultural Society, Indiana.

The date of our organization was in 1854, and of the charter in May, the same year. We have 256 members, each paying an initiation

fee of $1, and an equal sum annually. Other funds are obtained by the charge for gate fees, being 25 cents for each person. Our Society, at present, possesses a Fair ground, valued at about $1,000. At the annual exhibition, in 1858, we paid for premiums $276, the largest of which were $10 each, for the best horses, cattle, and swine. About two hundred volumes are contained in our library, valued at $500.

One of the benefits resulting from our Society is the distribution of seeds from the Patent Office; another, the pride and emulation caused by the annual Fair among our community. The meeting of the farmers and mechanics of the county is important, as producing an interchange of thoughts and experience. An improvement in mind and manners is the result, and the awakening of an interest before entirely dormant.

Randolph County Agricultural Society, Indiana.

This Society was organized and chartered April 17, 1852. The present number of members is about 500, each paying $1 initiation fee, and an equal sum yearly. Rent of stalls, licenses, &c., furnish additional income. We have $250 in cash and a ten-year lease on grounds, where a Fair is held annually, when about $500 are paid for premiums, the largest being $10 for the best cultivated farm, and $8, each, for the best horse and best bull. These exhibitions have been confined to the county, but will hereafter be open to all applicants. We report our transactions to the State Board, by which they are published every two years. Whatever books we obtain are distributed among members, not kept to form a library.

Our people are beginning to take an interest in agricultural pursuits. As to domestic animals, we have been benefitted to a great extent. A few years ago, there were no cattle, horses, sheep, nor swine, except the ordinary stock, but now the county will compare favorably with any of its neighbors.

Ripley County Agricultural Society, Indiana.

This Society was organized July 30, 1858, and chartered February 17, 1852. The present number of members is about 150, each paying $1 initiation fee, and an equal sum per annum; or $10 for life. The sale of tickets further increases our income. An annual Fair is held, when the amount awarded as premiums varies from $400 to $500, the largest being $10 for "sweepstakes" for cattle and horses, and stallions for general purposes. We report yearly to the State Board, by which our transactions are published.

We have found numerous benefits resulting from this organization, such as a general improvement of field produce and of live stock; while the farmers themselves have advanced morally and mentally.

Shelby County Agricultural and Joint-Stock Association, Indiana.

This Association was organized November 1, 1851, and chartered December 3, the same year. We have at present 675 members, each paying $1 at initiation; or $10 for life. By donations and sale of tickets to the Fairs, we increase our funds. We possess 10 acres of land, all well improved, with over two hundred good stalls for stock. Fairs are held semi-annually. About $800 are awarded a year as premiums, the largest being $25 for female equestrianship, and $10 for live stock and farm implements. We pay $10 per annum for a lecture. Our trial-ground consists of 5 acres. A Report is published of the proceedings of the exhibition and of the premiums distributed.

The Fairs have been beneficial throughout the State. Farmers raise on an average a fourth more grain on the same quantity of land than was usual before; and live stock has also greatly improved.

Steuben County Agricultural Society, Indiana.

This Society was organized November 1, 1851, under a general law of the State. The present number of members is 45, each paying an initiation fee of $1, and an equal sum yearly. Many members return their premiums to the Society, thus increasing its funds. A Fair is held annually, when about $100 are awarded as premiums, the largest being $5 for stallions and cattle.

A more scientific mode of farming is being adopted, and more care used in selecting and rearing cattle.

Sullivan County, Branch of the Indiana Agricultural Society.

This Society was organized in 1851, and at present contains 210 members, each paying $1 initiation fee, and an equal sum annually. From gate charges and show licenses we obtain additional funds. Our treasury possesses about $100. We hold a yearly Fair, when $325 are awarded as premiums, the largest being $10 for the best farm. Five dollars, per annum, are paid for an address.

Great improvement has been made in all the departments of agriculture.

Tipton County Agricultural Society, Indiana.

This Society was organized June, 1855. The present number of members is 150, each paying an initiation fee of $1, and an equal sum yearly. Charges for admission to the exhibitions further increase our funds. A Fair is held annually, when $300 are awarded as premiums, the largest being $5 for best horses, cattle, and swine.

There is a steady improvement in live stock and in farm produce.

Vanderburgh County Agricultural and Horticultural Society, Indiana.

This Society was organized September 1, 1855. The present number of members is 179, each paying $1 per annum. Admission charges to the grounds furnish additional income. Our real estate, including improvements, is worth $5,000. An annual Fair is held, when about $700 are awarded as premiums, the largest being $30 for the best fire-engine; $25 for the best steam-engine; $20 for the best stallion; and $15, each, for the best bull and cow. We publish only the annual address and list of awards.

Our monthly meetings afford good opportunities for interchange of opinions on the various modes of cultivating field crops, the diseases to which our fruits are liable, and the introduction of new varieties. We observe a decided improvement in farm and garden products.

Warren and Fountain County Agricultural Society, Indiana.

This Society was organized in the spring of 1853, and contains about 500 members, each paying $1 initiation fee, and an equal sum annually. From the sale of tickets, badges, &c., at the Fairs, we derive additional income, and the whole amount now on hand is $800. At each yearly Fair about $1,000 are expended for premiums, the largest having been $7 on horses, jacks, &c. We possess a trial-ground. Our transactions are forwarded to the State Board of Agriculture, and published annually in their Report. About fifty volumes compose our library, worth $75.

Our exhibitions are numerously attended, the receipts last fall being over $1,700. Farmers appear to be aroused to their interest. A fine display of all farm products was presented, many of these originating from seeds furnished by the Patent Office; and a variety of implements was also on exhibition.

Wells County Agricultural Society, Indiana.

This Society was organized February 22, 1853, under a general law of the State. The present number of members is 120, each paying $1 initiation fee, and an equal amount yearly. All license charges for circuses and other exhibitions are appropriated for our benefit. Our treasury contains $200. An annual Fair is held, when $150 are awarded for premiums, the largest being $5, principally for crops. For lectures, we pay $10 a year. Our library contains forty volumes, valued at $40. We have, for breeding purposes, some good horses, a few Durham cattle, and most of the choice breeds of swine.

Thus far, the benefits of our Society have been chiefly confined to its members, and consist, in part, in possessing superior live stock, as well as an improved condition of their farms.

Iowa State Agricultural Society.

Organized June, 1854. The Presidents of County Societies are members of this, by virtue of their office, each paying $25 for life membership. An annual appropriation of $200, and receipts from entries and admissions, further increase our funds. We have now about $700 in the treasury. A Fair is held yearly, when $200 are paid for premiums, the largest, $20, being offered for bulls and stallions. We publish an annual volume of Transactions of four hundred and fifty pages. Three thousand copies are printed. Our library contains two hundred volumes, valued at $300.

The most marked result of this Society has been effected in educating farmers as to what constitutes good animals. Our exhibitions are great schools of comparison and experience. The increase of crops is not so manifest, from the fact that the last two or three years have been unfavorable.

Boone County Agricultural and Industrial Society, Iowa.

This Society was organized October 24, 1857, under a general law of the State. The present number of members is about 200. An annual payment of $1 entitles to membership. We derive further income from admission charges to exhibitions. Our treasury now contains $117. A Fair is held once a year. In 1858, $83 were paid for premiums, the largest being as follows: for the best blooded stallion, $5; best blood mare, $4; best bull, $3; and an equal sum each for the best Merino ram or ewe; best fall and spring wheat, and greatest yield per acre; best sample of Sorghum sugar, or molasses; and corn on three contiguous acres. For the purposes of breeding, we possess a few Durham and Devon cattle, and swine of the Byefield and Suffolk varieties.

A general and increasing interest has been exhibited since the commencement of our Society, and the coming season, if favorable, will witness the largest growth of farm produce ever harvested in our county. Much anxiety is felt to obtain good seeds.

Cedar Valley Agricultural and Manufacturing Association, Black Hawk county, Iowa.

This Association was organized July 1, 1857, and admitted into the State Board, January 11, 1858. Its present number of members is 300, each paying an initiation fee of $1, and an equal sum annually. We obtain other funds by subscription; and now possess, in cash and property, $400. In September or October of each year, we hold a Fair, when from $500 to $1,000 are paid for premiums, the largest having been $12 for the best ploughing. Our transactions are published occasionally in the several papers of the valley.

There is a decided and increasing improvement in crops and domestic animals with us; and we are doing good, generally.

Davis County Agricultural Society, Iowa.

This Society was organized July 16, 1853, under a general law of the State. The present number of members is 74, for life, and 120 annual, the former paying $10, and the latter $1. Donations from the State, being $200 yearly, admittance to Fairs, rent of land, and private contributions increase our funds. We possess a Fair ground, which, with its inclosure, cost $1,000. An annual exhibition is held, when $400 are awarded for premiums, the largest being $10 for blooded stallions and bulls. Our transactions are published yearly by the State Society.

The benefits resulting from our organization have been—the assembling of agriculturists, and impressing them with a more exalted view of the dignity and importance of their calling; a large amount of information is gained by the exchange of ideas, experiments, and results; and the introduction of improved cattle. When this Society was formed, we had not a thorough-bred horse, bull, nor cow, in the county; but we have since taken the highest premiums for these animals at the State Fairs. We possess a few fine sheep and swine. This is the largest pork-raising county in the State. In the management of field crops, we have made great advances, putting them in more carefully, and being more attentive to the land.

Dubuque County Agricultural Association, Iowa.

This Association was organized January 12, 1853, and contains about 200 members, each paying $1 initiation fee, and a like sum annually. The State appropriates an equal amount to that obtained by the Association; and donations are also received from individuals. A Fair is generally held once a year, when all the money we have on hand is paid for premiums, the largest of which has been $20 for the best threshing machine.

Our Association has been productive of good in bringing our farmers together at stated periods. The breed of domestic animals has been improved, and especially that of swine. Some of us have learned the value of rye, over every other Cereal, for this region, and of the giant sunflower, distributed by the Patent Office. One acre of this plant, when dried, including the seed-heads and stalks, is asserted here to be equivalent, as fuel, to 16 cords of wood; and there is no doubt that it may be thus used with advantage in places remote from timber, far west of us. Our general crops are increasing to the acre, and are more carefully put in; while labor-saving machines are more used, and the value of the roller is better understood.

Fayette County Agricultural Society, and Mechanics' Institute, Iowa.

This Association was organized March 3, 1855, under a general law of the State, and at present contains 100 members, each paying $1 initiation fee, and an equal sum annually; or $10 for life. The Legislature makes a yearly appropriation for our benefit. The amount of funds now on hand is $164. An annual Fair is held, when $200 are paid for premiums, the largest being $3 for the best stallion. Our own members deliver lectures gratuitously. An account of our transactions is published in the newspapers of the county.

Comparison of animals, crops, and modes of culture gives our farmers the benefit of each other's experience, and awakens a general interest in agriculture.

Henry County Agricultural Society, Iowa.

This Society was organized October 30, 1852, and chartered July, 1858. It now contains 206 members, each paying $1 initiation fee, and an equal sum yearly. We receive $200 annually from the State, and voluntary contributions. A Fair is held each year, when about $275 are awarded as premiums, the largest being an agricultural periodical and $10 for the best herd of cattle, consisting of a bull and four cows, or heifers, of any age or breed, from one township; and an agricultural paper and $8 for the best variety of fruit. A yearly Report of our transactions is published in the volume of the State Society.

Our exhibitions have proved beneficial. They are calculated to develop more fully than would otherwise be possible, the agricultural and mechanical resources of the county.

Jackson County Agricultural Society, Iowa.

This Society was organized February 22, 1853, and chartered July 10, 1858. The present number of members is 93, each paying an initiation fee of $1, and an equal sum annually. The latter can be changed at each yearly meeting by a vote. We receive from the State such an amount as may be obtained by subscription and membership each year, not exceeding $200. An annual Fair is held. The premiums for 1857 were $257, and for 1858 $230, the largest ever offered, being for grain crops and ploughing, each $5, and $3 on cattle and horses.

The benefits resulting from this organization are—by comparison and competition we have been led to improvement in nearly every department of agricultural operations. Many have been induced to leave the paths trod by their fathers, and to investigate for themselves, and consequently have learned that farming is as susceptible

of advancement as any other division of industry, and for the farmer to become scientific is the shortest way to wealth and prosperity. There was scarcely an improved animal within the county at the organization of this Society, while now, we number Morgan, Black Hawk, and other fine stock horses by the score; and of Durham and Devon cattle, we have at least fifty; sheep, of Spanish and French Merinos, by the hundred; and many swine of the best breeds.

Jefferson County Agricultural Society, Iowa.

Our present number of members is 304. An annual payment of $1 entitles to membership. The charge for admission to our exhibitions furnishes additional income. We own a ten-acre lot, quarter of a mile from Fairfield, valued, with its improvements, at $1,500; and also have about $800 in our treasury. A Fair is held yearly, when $500 are paid for premiums, the largest being $10 each, for the following objects: The best three acres of corn; best bull; cow and best herd, each, and best blooded stallion. A list of the awards is published annually in a newspaper.

Our Society has induced farmers to import some fine breeds of cattle, a few good stallions, and approved varieties of swine. We were the first to place in the hands of our people the Sorghum, the Chufa, and other valuable plants received from the Patent Office.

Johnson County Agricultural and Mechanical Society, Iowa.

This Society was organized in 1853. Its present number of members is 370, each paying $1 annually, or a fee of $5 for life membership. We also receive from the State Treasury $200 a year, and by a special act of the Legislature, 33⅓ per cent of the personal poll-tax levied by the county. An annual Fair is held, when about $700 are paid for premiums. We own 20 acres of land near the corporate limits of Iowa City, inclosed by a substantial board fence 8 feet high, within which are temporary fixtures, and a fine trotting course of half a mile in circumference. The largest premium we have ever offered is $15, which is a standing one, for the best managed farm in the county. All recipients of Patent Office seeds are required to report the results of their experiments to the Society. Our annual publications have thus far been limited to the reports of awarding committees, and an abstract of the treasurer's account.

The benefits resulting from our organization have been a marked improvement in the modes of cultivation; the use of better implements; the introduction of the best breeds of cattle, horses, sheep, and swine; the multiplication of our staples; and the greatly enlarged circulation of agricultural publications.

Kossuth County Agricultural Society, Iowa.

This Society, organized in October, 1857, has 46 members, each of whom pays $1 initiation fee, and a like sum annually. The State gives all County Societies an amount equal to what they collect, not exceeding $200 to each. We hold a Fair yearly, and at the last, $49 were paid for premiums. An annual manuscript report and abstract of premiums is sent to the secretary of the State Agricultural Society.

Our Fair was well attended, and a new interest seems to pervade the farming community.

Linn County Agricultural and Mechanical Society, Iowa.

This Society was organized July 16, 1855, and chartered July 20, 1857. The present number of members is 204, each paying $1 yearly. Donations from the State and individuals constitute additional funds. We possess 15 acres of land, worth $30 per acre. An annual Fair is held, when $143 are paid for premiums, the largest being $10 for the best farm of 160 acres.

Louisa County Agricultural Society, Iowa.

This Society was organized January 25, 1850, and chartered September 1, 1851. It now contains 50 members, each paying $1 initiation fee, and an equal sum annually. An amount is received yearly from the State, corresponding to that contributed by the members. At present, we possess 20 acres of land, 10 of which have been donated, on condition that we pay $20 per acre for the remainder within two years. An annual Fair is held, when $150 are awarded as premiums, the largest being $5 for blooded stock. Once a year, we report the condition of agriculture in the county, which is published by the secretary of the State Society in his general Report.

The chief benefits resulting from this organization may be thus enumerated: It brings farmers together to compare notes, views, processes and products: it leads to reflect, to compare, and to strive for improvement; and it affords facilities for intercourse with other counties, and a knowledge of their experience. A marked improvement is therefore observable among us.

Farmers' and Mechanics' Benevolent Reform Association, Marshall county, Iowa.

This Association was organized January 30, 1857, and the present number of members is 50, each paying an initiation fee of 25 cents, and contributing an annual donation of such things as he may raise

or manufacture, which is sold, and the proceeds added to our fund. We possess a lot of 3 acres, where we are now engaged in erecting a lecture room. A yearly Fair is held; but we pay no premiums as a Society, though any member may offer them, or anything he thinks proper, being individually responsible. In this manner, $12 have been awarded for the best 10 rods of hedge, and $3 for the largest quantity of gopher scalps, with the best method of entrapping the animal. Our library consists of one hundred volumes, valued at $30. A museum has been commenced, and we have several geological and other specimens.

We try to induce our farmers to be observing men, to use the best means within their power for improvement, and to report progress. We meet once a month, and discuss various subjects. Four members, two of each sex, are appointed at each meeting to address the Society at the next, on agriculture, or any subject of interest and importance which they may select. We generally contribute liberally at the annual Fairs, of the fruits of our labor, the proceeds being applied to benevolent purposes. The object of the Association is benevolence and reform in the fullest sense of the duties of life, drawing attention to the necessity of cleanliness of person and the laws of health in general, economy of means and time, and everything that tends to the elevation of the masses, morally and socially.

Agricultural Society of Muscatine County, Iowa.

This Society was organized October 9, 1852, and chartered October 9, 1858. The initiation fee of membership is $1 each, and an equal sum annually. Further income is derived from entry fees, admittance charges to grounds, refreshment stand, rent of stalls, &c. A Fair is held yearly. In 1858, the amount expended for premiums was $259. Our transactions are published in the newspapers.

Polk County Agricultural, Horticultural and Industrial Association, Iowa.

This Association was organized May 28, 1853, and incorporated under the general law. We have 295 members, each paying an initiation fee of $1, and an equal sum annually. The State gives $250 a year, if the funds from membership amount to so much, and smaller appropriations in proportion. We own 35¼ acres of inclosed ground within the corporate limits of Des Moines, costing $3,550, and about half paid for. A Fair is held annually, at the last of which $295 were paid as premiums, the largest being $10 (a silver cup) for the best cultivated and improved farm.

As yet, but little has been done; but in 1857, our county Fair was scarcely inferior to that of the State.

Poweshiek County Agricultural Society, Iowa.

This Society was organized in 1855, under a general law of the State. There are at present 52 members. Heretofore, the initiation fee has been $1, but at present, the amount of charge is discretionary with the Executive Committee, directed only by their judgment of what may be best adapted to the Society. The State contributes for our benefit an annual sum equal to that received from members, not exceeding $200. We have a lease for a term of years on a Fair ground, where an exhibition is held annually, when from $50 to $60 are paid for premiums, $5 being the largest offered. Our transactions are reported once a year to the secretary of the State Agricultural Society, by whom they are communicated to the General Assembly, and afterwards published at the expense of the State.

Though this county has not been long organized, yet our farmers are making rapid improvement. Much interest has been manifested in our Society, and the favorable results are evident. We are introducing improved breeds of stock, all of which seem to succeed well on the prairies.

Scott County Agricultural Society, Iowa.

This Society was organized August, 1853, under a general law. The present number of members is about 500, each paying $1 a year. Our other modes of obtaining funds are—$200 from the State; charges for admission to grounds; fees for the exhibition of horses; and rent of refreshment stands. The Society is half owner of its Fair ground, consisting of 8 acres, inclosed with a high fence, and improved by a secretary's office and other buildings. The remaining part is the property of individual members. An annual Fair is held. At the recent exhibition, $663 were awarded as premiums, the largest offered being $10, each, for the best conducted farm; for the best 10 pounds of sugar from the Chinese cane; and for the best stallion of any age or breed. Our transactions are published by the State Society.

All, and especially the young, are ambitious to excel in agriculture, while some have been induced to procure better breeds of stock. Many branches of domestic arts and manufactures have advanced. Groves of timber and live fences are being generally cultivated—a most important object in this prairie country.

Tama County Agricultural and Mechanical Society, Iowa.

The date of our organization was in August, 1858. We have at present 78 members, each paying $1 initiation fee, and a like sum annually. From the State, we receive as much as other County Societies, up to $200. An annual Fair is to be held, at which premiums will be offered, the largest being $5, for stock of various kinds.

Our proceedings and list of prizes will be published in the county papers.

The usual benefits attending the exhibition of stock, grain, &c., have thus far been enjoyed by us.

Van Buren County Agricultural Society, Iowa.

This Society was organized September 27, 1851, and chartered February, 1852. The present number of members is 400, each paying an initiation fee of $1, and an equal sum yearly; or $10 for life. We obtain other funds from the State; and also own 5 acres of land. An annual Fair is held, when $500 are awarded as premiums, the largest being $8 for the best stallion. Our list of prizes is published in the newspapers.

An increasing interest is evinced for improvement in agricultural pursuits.

Webster County Agricultural Society, Iowa.

This Society was organized in 1858, and now contains 200 members, each paying $1 initiation fee, and to pay an equal sum annually. We also receive from the State $200 when a corresponding amount may be obtained by our own efforts. A yearly Fair is held, at which about $200 are paid for premiums, the highest being $5 for the best female equestrian; an equal sum for the best matched horses; and $3 for the best syrup from the Chinese sugar-cane.

Our success has exceeded expectation. The most remarkable features of the Fair were—the extraordinary size of the vegetables; the excellence and number of samples of sugar-cane syrup; and the exhibition of sweet potatoes. Among the benefits, not the least are those derived from the distribution of seeds from the Patent Office.

Wright County Agricultural Society, Iowa.

Our Society was organized July 31, 1858. Its present number of members is 45, each paying an initiation fee of $1, and an equal sum annually.

As we have existed so short a time, and as most of our farmers have but small means, owing to the expense of purchase and improvement of land, they are not yet able to take hold with energy. Something must be done, also, to inspire them with more confidence in their own skill, and in the importance of a Society of this kind. Hence it is desirable to procure as many seeds, books, &c., for distribution as possible. In one respect, however, valuable information has been obtained by our meetings, namely, as to the wheat best adapted to our soil in wet seasons. We have generally sown the

Canada Club spring wheat, which, until lately, did well; but whoever has used the Black Sea wheat has harvested a good crop in situations similar to those in which the former entirely failed. Our farmers, therefore, begin to perceive how knowledge springs from association.

Kentucky Agricultural and Mechanical Association, Fayette county.

Organized and chartered April 20, 1850. This Association has now about 550 members. The payment required for annual membership is $4, that for life $25, and for perpetual $45. Admission charges further increase our fund. We own 52 acres of ground in the city of Lexington, upon which are erected a large amphitheatre, Gothic cottage, a brick dwelling, and stables. Our Fairs are held annually, when the amount paid for premiums varies from $1,800 to $2,000, the largest being $20. Prizes are awarded for every variety of stock produced in our State and imported into it; also for manufactured articles, including those of hemp, wool, and cotton; and for mechanical implements and tools. We report our transactions to the State Agricultural Society. The library of the Association consists of the Reports of the Patent Office, and those from Agricultural Societies.

The benefit resulting from this institution is mainly in the great improvement of domestic animals, which is strikingly apparent from year to year, more and better blood horses, roadsters, Durham cattle, sheep, and swine being collected at each Fair. Premiums being given for the largest yield of the products of the State, an emulation has arisen among our agriculturists.

Franklin County Agricultural Exchange, Kentucky.

The date of our organization was in April, 1856. As we have held no meeting recently, the number of members cannot be given. Our charges are $1 each at initiation and an equal sum annually. A monthly Fair is ordered.

The "Exchange" was intended to aid each other in monthly sales of stock and produce; in the improvement of horses, mules, cattle, sheep, and swine; and in the distribution of superior field and garden seeds, and of books from the Patent Office or other sources.

Southern Agricultural Society of Louisiana.

Organized and chartered August 4, 1854. This Society now contains about 30 members, each paying an initiation fee of $5, and an equal amount annually.

We have not yet held a Fair.

Cumberland Agricultural and Horticultural Society, Cumberland county, Maine.

This Society was organized May 2, 1852, and chartered the same year. The present number of members is 518, each paying $1 initiation fee, and an equal sum annually; or $10 for life membership. By admission charges at our Fairs, we obtain an increase of funds; and our treasury contains $843. A Fair is held once a year. In 1858, the amount paid for premiums was $513, the largest ever offered being $150. We expend annually for lectures $25. A pamphlet of our transactions, consisting of sixty-four pages, was published in 1858.

The most marked improvement is in our stock. Many pure-blooded animals of the different breeds have been brought into the county, and a great interest prevails among the farmers to obtain the best.

The subject of under-draining is attracting attention, and many experiments have been made within a few years, all of which are thought to have been successful.

Franklin Agricultural Society; Franklin county, Maine.

This Society was organized March, 1841, and chartered January, the same year. The present number of members is 600, each paying $1 initiation fee, and an equal sum annually; or $10 for life. Our funds were increased, in 1858, by $200 from the State; admittance to show and Fair grounds, $212; tent grounds, $2,400; and donations, $17. We possess real estate, with improvements, valued at $1,500. A yearly Fair is held, when $550 are awarded as premiums, the largest being for speed horses, $15; for Durham bulls, cows, and stallions, $5 each; for the best acre of corn, wheat, or oats, each, $3; for Cotswold, Southdown or Merino bucks, $2 each; and an equal amount for ewes. We expend about $10 a year for lectures. Hitherto, our transactions have appeared only in the county papers, but we intend hereafter to publish them in a pamphlet.

Our neat stock has greatly improved. Four years ago, there probably was not a pure Short-horned bull in the county; now there are about ten, including some recently brought from New York at a cost of $1,000. The celebrated Eaton horses have more than doubled in value within that time; and the increase of crops, particularly oats, corn, and barley, is equally great. Among the premiums lately distributed were agricultural books, worth $75, the best to be found in the country.

Kennebec County Agricultural Society, Maine.

This Society was chartered by the Massachusetts Legislature February 20, 1818, and organized on the 4th of July of the same year.

It was rechartered by the Maine Legislature February 20, 1832. Our present number of members is 353, each paying $1 initiation fee, and an equal amount annually. The sum of $6 constitutes life membership. We receive $150 from the State, and entrance fees at the Fair from those who are not members. About $400 worth of fixtures on rented land comprises our present property. A yearly Fair is held. In 1858, we paid for premiums $306, the largest being $25 for the best trotting horse. From $6 to $25 are allowed for the annual address, and the same amount for experiments. We have a course for speed horses, and a yard to test the training and strength of oxen and steers.

The fruit crop, particularly the apple, has been doubled within a few years, and is the source of a large income. Stock of all kinds has greatly improved, and we have of late reared and sold horses for $1,000, and upward, each.

Bethel Farmers' Club, Oxford county, Maine

This Club was organized December 22, 1853. It now has 40 members, each paying $1 at initiation. An annual Fair is held, at which no premiums are awarded, but, from the examination and report of a committee, honorable mention is made of the most meritorious articles. This system we have found more satisfactory to the exhibitors than if money prizes were bestowed. We meet semi-monthly, in the winter, to discuss agricultural and horticultural subjects. Reports of these meetings are published in our village, county and State papers. Our library contains one hundred and sixty-five volumes, valued at $150.

As a result of the efforts of this Club, our farmers are becoming better educated, and consequently more successful.

Penobscot and Aroostook Union Agricultural and Horticultural Society, Penobscot county, Maine.

Organized June 23, 1853, and chartered March 19 the same year. Our present number of members is 64, each of whom pays $1 per annum, which, with donations, forms our fund. A Fair is held yearly, when $180 are paid for premiums. The largest awarded has been $5 for a Durham bull. For lectures, we pay $9 per annum. Our transactions are published annually in the Report of the Secretary of the Board of Agriculture of the State.

Owing to the influence of this Society, there has been an increased interest in farming operations. The corn crops have become larger, and a considerable improvement has taken place in stock.

Sagadahock Agricultural and Horticultural Society, Sagadahock county, Maine.

This Society was organized July 1, 1854, chartered April 14 the same year, and now numbers 469 members. The initiation fee is $1, the annual payment being a similar sum, and the amount required for life membership $8.

The grounds and buildings are inclosed, and we sell tickets—members' and single tickets. The proceeds of these constitute our principal income. We possess real estate, buildings, fixtures, &c., to the amount of $3,884. A Fair is held annually, in October, when about $402 are awarded in premiums. The largest ever offered, $15, was for the best conducted farm, and the next for town teams, and under-draining lands. We only publish our proceedings in the county newspapers, but make an annual Report to the State Secretary.

Our Society is yet young, though vigorous and growing. It has thus far been remarkably successful. We have, beyond doubt, the best grounds, buildings, fixtures, &c., in the State. The people of the county take a very general interest in the Society; and we believe it has been, and continues to be, the means of exciting attention to agriculture among the mass of the population. It has served to introduce new breeds of cattle and a considerable improvement in the native stock, while horticulture and fruit-raising have been promoted. It has led quite a number to experiment with new seeds, and has extended the culture of roots, carrots, beets, turnips, &c. Roots are more valuable than the people are yet aware. They are easily and cheaply raised in our section, were our farmers but fully convinced of their importance. Wheat is not produced in our county, except to a limited extent. There has not been much increase, per acre, in our crops within the last five years.

West Somerset Agricultural Society, Somerset county, Maine.

Organized September 23, 1848, and chartered August 10 the same year. Our Society has now 150 members, each paying $1 at initiation. The State donates a special sum for agricultural purposes. An annual Fair is held, when from $150 to $180 are paid for premiums, the largest being offered for the encouragement of rearing neat stock and sheep, in which branches we excel. We expend per annum for lectures from $5 to $15, and a small amount for experiments. A Report of our transactions is published.

There has been a marked improvement in the general interests of agriculture, and its operations have become more systematic. The waste places are being reclaimed by clearing, draining, &c.; fertilizers sought for with more eagerness, and greater care is used in saving the liquids about the house, barn, &c. The comfort of stock obtains more attention, and shelter, with cribs for feeding sheep in bad weather, have been provided. A corresponding advancement in these departments has been the result.

Frederick County Agricultural Society, Maryland.

This Society was organized May 21, 1853, and chartered June 3, 1854. The present number of members is 1,200, each paying $1 a year; or $5 for life. Other funds are obtained by subscription. An annual Fair is held, when about $1,300 are awarded as premiums, the largest being $25 for the fastest horse.

Massachusetts Society for Promoting Agriculture.

The date of our organization and charter was in 1792. No catalogue of our members has been prepared for several years, but we have about 300.

From the State, we receive $600 per annum, besides gifts and bequests from other sources. The Society possesses funds to the amount of about $34,000, principally invested in bank stock. Fairs, as a general thing, have been discontinued for many years, as they were found to interfere with those held by the County Societies, of which there are now twenty, each having an annual exhibition. The amount expended for premiums by our Society varies from year to year, according to circumstances, from $600 to $3,500. The largest ever offered has been $1,000, one for the best mowing machine, and one for the best plantation of trees for ship-building purposes. Others have occasionally been awarded for experiments, but there is no regular appropriation for this object. For several years, from $100 to $200 annually were expended for cuttings and seeds for distribution, and formerly much more, as this Society originated, sustained, and principally endowed the Botanic Garden at Cambridge, now connected with Harvard University.

The publications of the Society extend to many volumes, averaging three hundred pages each, besides printing, for general distribution, essays upon agricultural subjects. The series of publications commenced in 1858 are to be continued annually. We have about two hundred volumes in our library. Improved agricultural implements are occasionally imported for trial, and if thought to be adapted to the wants of New England, they are recommended to the manufacturers for introduction. Stock, also, has been imported for breeding, and we now have a herd of Ayrshire cattle, numbering 15, which will be kept with the intention of distributing the offspring through the State.

From the low ebb to which agriculture had sunk sixty years ago, our Society has raised it to the highest "flood of fortune."

State Board of Agriculture, Massachusetts.

This Board was organized April 21, 1852, as a department of the government, and not as a Society. There is no charter, except the

law of organization, signed by the Governor, who is Chairman of the Board. The present number of members is 21, chosen by the County Agricultural Societies, the Governor, Lieutenant Governor, and Secretary of State, with three members at large, making 27 in all. We are authorized to "take, hold in trust, and exercise control over any donations or bequests that may be made for promoting agricultural education or the general interests of husbandry." Direct appropriations of the Legislature are also granted to us. We hold in trust the State farm and its appurtenances, valued at over $20,000. Fairs do not come within the province of the Board. At Boston, in 1857, however, one was held, by request, and we may have another in 1860, and at intervals of five years thereafter; but this is not yet determined. Experiments are made, under the direct charge of the Board, at the State farm, and paid for by the State, together with the farm expenses, and not kept separate. The cost of experiments is simply the additional labor, which is trifling. A volume of Transactions is published, annually, at the charge of the State, and required by law to be prepared by the Secretary of the Board, at whose discretion the size may vary from six hundred to nine hundred pages. Eight thousand copies are printed for the Legislature and for gratuitous distribution. Our library consists of about fifteen hundred volumes, valued at $2,000. We possess a museum, containing models of implements, prepared birds, specimens of grasses and grains, a complete collection of the minerals and soils of the State, the salt and fresh water fishes, insects, &c. We hold in trust, for the State, Jerseys, Ayrshires, Short-Horns, Herefords, Devons, and various grades of domestic animals, kept at our farm for purposes of breeding.

An increased interest has been awakened among all classes of people, more inquiry and attention being given to every kind of agricultural improvement, and especially to the breeding of imported stock, by which the material wealth and resources of the State are rapidly advancing. As evidence of this, there never was a year when people attended the county Fairs in such numbers as in the present. The improvement now progressing in our stock is a subject of frequent remark, and is apparent to all conversant with these matters.

Barnstable County Agricultural Society, Massachusetts.

This Society was organized May 25, 1843, and chartered March 15, 1844. Our present number of members is 229. For life membership, $10 are required. Voluntary subscriptions and interest on funds are other modes by which we obtain money. We have now on hand $6,000. A Fair is held annually, when about $500 are paid for premiums, the largest being $12. An address is delivered before us each year, but costs us only the incidental expenses. About $75 are expended, per annum, for experiments. We possess a trial ground, of 16 acres, on which is a large hall. Our Transactions are published

yearly, embracing about fifty pages. Three hundred copies are printed.

It is difficult to state in detail the benefits resulting from our Society, without going into the subject at much length. Suffice it to say, that the progress of agriculture has been expedited, and its work improved.

Essex Agricultural Society, Essex county, Massachusetts.

This Society was organized and chartered in 1818. The present number of members is about 1,000. An initiation fee of $3 each is the only payment required. We receive $600, annually, from the State, and about as much more from our permanent fund. In bank stock and notes, secured by mortgage, we have $9,000; also, in real estate, a farm, recently bequeathed to us, worth $6,000. A Fair is held yearly, when $1,300 are paid for premiums, the largest being $100 for farms and forest trees, and $50 for horse-mowers and new and early varieties of grapes. Our farm, containing 155 acres, is under rent for $175 per annum. This income, we expend in experiments. We publish an annual volume of Transactions, which, for the last ten years, has averaged two hundred pages, and from twelve to fourteen hundred copies. Our library consists of over a thousand books, valued at from $800 to $1,000. We have recently added $200 worth. Unclaimed premiums furnish a fund for this purpose.

The influence we have exerted on agriculture by the publication of our Transactions and by the yearly Fairs has been of great benefit. Crops and animals have been improved more by the diffusion of information than by attention to any particular subject, though, at present, the horse receives more encouragement by premiums for the best. But, with us, the trial of speed is not a desideratum.

Amesbury and Salisbury Agricultural, Horticultural and Ornamental Tree Association, Essex county, Massachusetts.

Organized by the laws of the Commonwealth, April 14, 1856. Our Association, at present, contains 120 members, each paying 25 cents initiation fee, and an equal sum per annum. The entrance fees to exhibitions furnish additional funds. We hold a Fair once a year, when $75 are paid for premiums, and diplomas awarded for the best cattle, sheep, swine, poultry, fruits, and agricultural and mechanical productions; of these diplomas, three hundred and sixty-five were given at the Fair of 1858. Our library consists of about three hundred volumes, a number of them being gifts, and we have expended $100 for this object.

The benefits most certainly resulting from our organization are found in the increased attention given to the growth of fine fruits, and the improvement of farm and dairy stock.

Franklin County Agricultural Society, Massachusetts.

This Society was organized May 24, 1850, and chartered March 7, the same year. It has now 1,100 members, each paying $1 per annum; or $5 for life membership. Our other modes of obtaining funds are from the $600 annually appropriated by the State and admission fees to the exhibition hall. In notes and mortgages, we possess $4,700. We hold a Fair once a year, when from $550 to $700 are paid for premiums, the largest being $20 for "town teams;" $7 for working oxen; $9 for fat cattle, and an equal sum for steers; $7 for a bull; $8 for dairy cows; $12 for the best three acres of corn; $5 for the best acre of the same grain; $6 for the best wheat; $6 for the best apple orchard, and an equal sum for the best pear orchard; $5 for manures; $6 for stallions; $5 each, for mares, and geldings; and $10 for improved pastures. We expend $20 for an annual address, and $50 per annum for experiments in the improvement of lands, manures, &c. About eleven hundred copies of our Transactions are published yearly, containing one hundred pages.

Our Society is popular among the farmers; and the stock has been improved by the extensive introduction of Short-Horns. We produce more and better steers than any section of like size in our part of the country, and have the Southdown, Cotswold and Leicester sheep, and Suffolk swine, generally crossed with our large breeds. We are gradually growing more roots.

Hampden County Agricultural Society, Massachusetts.

The organization of this Society was in 1844, as nearly as I can determine, and the first recorded meeting in February, 1847. We have at present 959 members, who have paid an initiation fee of $5 for a male, and $2 50 for a female, which sums give the privileges of the Society without further payments. An income from our Park, or grounds, is another mode of obtaining funds. We also possess 60 acres of valuable land, lying on the bank of the Connecticut, with buildings, at a cost of $31,000, now worth much more; and personal property to the amount of $1,000.

About $700 per annum are paid for premiums, the largest single offer we have ever made being $50, which was for farm improvements. We pay, some years, from $5 to $10 for experiments. Our transactions are published annually. In our stock library we have about one hundred and seventy volumes, embracing all the leading American and European works.

The distribution of the Agricultural Reports of the Patent Office, and the annual transactions of our State and County Societies act as a stimulus to the farmer, and by information thus derived he is able to increase his crop. Guano has been usefully employed, particularly on our plain land. Our annual exhibitions have always promoted the interest of the farmers. Stock in the county has advanced much

within the last three years; and ten or twelve men are now employed in raising blooded animals—the Short-Horn, Devon, and Ayrshire—while others are crossing them with good success.

Eastern Hampden Agricultural Society, Hampden county, Massachusetts.

Organized September 8, 1856, and chartered May 5, the same year. Our present number of members is 140. Each member gives his note for as many shares as he may desire at $5 per share, and pays the interest annually. Ladies are admitted to life membership on the payment of $1 each. The State also assists us, and we receive donations from individuals. A Fair is held annually. In 1858, we paid for premiums $518. The largest ever offered was $20 for the best experiment on the application of manure. We have paid $10 for an address, delivered on the second day of exhibition. For experiments, we expended, in 1858, $51. A volume of our Transactions, one copy to each member, is published annually, containing about thirty-eight pages.

The benefits resulting from our Society have been—the general interest induced in all departments of agriculture; more attention to the cost of crops, and keeping accounts of all expenses; in fact, a more systematic management of everything pertaining to the farms. The reclaiming of waste land, such as swamps, meadows, and worn-out pastures, also engaged attention.

Middlesex Agricultural Society, Middlesex county, Massachusetts.

This Society was organized January 6, 1794 under the name of "Western Society of Middlesex Husbandmen," and chartered February 28, 1804. The present number of members is over 500. Five dollars are paid by men, and $2 by women, which sum, in each case, constitutes life membership. We obtain further funds from the bounty of the Commonwealth, $600 per annum ; from the receipts of exhibitions ; and from donations, interest, &c. In real estate, stocks, and mortgages, we possess $5,000. An annual Fair is held, when $1,000 are awarded as premiums, the largest being $75, $50, and $25 for the best dairy of seven cows ; $50 for experiments in cultivating cranberries ; $25 for the best farm ; and $10 for the best horses, neat stock, &c. An address is delivered at each Fair, and is generally published. For experiments, from $50 to $100 are usually expended a year. We have a trial-ground of 5 acres, with a large building, and a circular course 40 rods long, for the exhibition (not speed) of horses. About a thousand copies of our Transactions are published annually, consisting of from fifty to a hundred pages.

The great benefit of this Society is in bringing together the most intelligent and public-spirited of our farmers, and enabling them to compare their stock, fruit, and other products, and to communicate the result of their labors and experiments. So important has this

proved, that agriculture here has materially advanced; and, to bring these advantages within the reach of all the farmers in the county, it has been deemed advisable to form two district Societies, which were organized in the northern and southern portions, respectively, within the last five years. They are now nearly equal in size and usefulness to the County Society. But, as our limits are so extensive, and as our exhibitions are held after those of the districts, most of the premium stock and produce is brought to the central Fair for comparison, &c., thus giving us a great advantage.

Middlesex North Agricultural Society, Middlesex county, Massachusetts.

The date of organization of this Society was May 28, 1855, and of its charter May 8, the same year. Our present number of members is 571. The initiation fee is $3, which entitles to life membership. Appropriations from the State and the proceeds of exhibitions furnish additional funds. We possess real estate valued at $3,000. A Fair is held annually, at which about $700 are paid for premiums, the largest being $40, for the best trotting horse. We publish our Transactions annually, in a pamphlet of about fifty pages, printing a thousand copies. Our library contains two hundred and forty volumes, valued at about $450.

The lively interest taken by members of our Society in agricultural pursuits warrants the assertion that we shall ere long have important evidence of its beneficial results.

Middlesex South Agricultural Society, Middlesex county, Massachusetts.

This Society was organized April 24, 1854, and chartered March 16, the same year. Its present number of members is 657. The payment of $5 constitutes life membership. Our other modes of obtaining funds are from the State appropriation of $600 per annum, from the entrance fees to exhibitions, and from the social meetings. In real estate, we possess to the value of $7,350, and in personal, $900. A Fair is held annually, when about $600 are paid for premiums, the largest being $85 for forest trees, as required by law. We offer prizes for experiments on manures, soiling of cattle, vegetables, improving swamp lands, pastures, cranberry vines, &c. Our Transactions are published every year, consisting of six or seven hundred copies, making, with the annual address, about seventy pages. Though we possess no animals for purposes of breeding, all persons who receive a premium on stallions, bulls, or boars, are required to keep them in the district a specified time.

The benefits resulting from our Society are—attracting the attention of farmers, and inducing them to apply vigorous, consecutive, and methodical thought to the subject of agriculture; with a desire to improve the quality of stock and methods of farming, by careful

experiment. We have reason to believe that agriculture has been stimulatod by the associated efforts of our district.

Concord Farmers' Club, Middlesex county, Massachusetts.

This Society was organized in 1851. The present number of members is 35, each paying $1. We obtain additional funds by assessments on members, when such a course may be adopted by vote. Our meetings take place one evening in each week from the first of November to the middle of April, discussions being held, essays and accounts of experiments read, and experiments assigned to individuals to be made the next season, and the results reported to the Club. We have a library of two hundred volumes, valued at $200.

Our members have become more intelligent and more observant of all agricultural operations. They cultivate their farms better. Grass crops have nearly doubled, and corn has increased 25 per cent. Their houses and barns have greatly improved. Implements are of much better quality. More fruit is cultivated, and more attention paid to gardening. Our association is advantageous, both intellectually and economically.

Groton Farmers' and Mechanics' Club, Middlesex county, Massachusetts.

This Club was organized November, 1854. The present number of members is about 100, each paying 75 cents a year. An annual Fair is held, when $200 are awarded as premiums, the largest being $10 for the best general improvement of farms. Our library consists of one hundred and fifty volumes.

Meetings for conversation and discussion are held once in two weeks in the winter, when, also, the results of experiments in agriculture are reported. We usually have an address at the Fair. The influence exerted is highly beneficial.

Pepperell Farmers' Club, Middlesex county, Massachusetts.

This Club was organized May 1, 1854, and has now 131 regular members and 3 honorary members. The initiation fee is 50 cents. Subscriptions and donations are our other modes of obtaining funds. A Fair is held annually, in October, at which $115 are paid for premiums, the largest being $4 for corn crops, and $3 on sundries, such as apple orchards, wheat crops, milch cows, and working oxen, aiming at a diffusion of small premiums rather than the concentration of largo ones as a means of exciting the greater interest in agricultural pursuits. We pay from $10 to $20 per annum for lectures, depending chiefly on gratuitous services. Though we expend no money in cuttings and seeds, we exchange and distribute them to a consider-

able extent. Our library contains one hundred and fifty volumes, valued at $200, not strictly the property of the Club, but of persons, most of whom are members, called the "Pepperell Agricultural Library Association."

As we have been organized but a short time, we cannot refer so confidently to substantial results attained as to the influence of our organization in awakening an interest in agricultural pursuits, inducing inquiry and investigation. Questions for discussion, drawn from some department of agriculture, are occasionally brought before our meetings, and have elicited great interest. The distribution of seeds, received at various times from the Patent Office, has opened the way for giving us some fine specimens of produce. Our exhibitions compete well with the Fairs of the Middlesex County Society, which embraces about forty towns in its organization.

Nantucket Agricultural Society, Nantucket county, Massachusetts.

This Society was organized April 7, 1856, and chartered February 21, the same year. The present number of members is about 200, each paying for life membership, if a male, $2, or a female, $1. We obtain further funds by charges for admission to the hall and grounds. Our treasury contains $1,150, and we possess real estate valued at $300. A Fair is held annually, when about $250 are awarded as premiums, the largest being $20 for the best pure-blooded bull. We pay for lectures, per annum, from $15 to $50. Our Transactions are published yearly, consisting of sixty pages and about three hundred copies. We possess a library of twenty-five volumes, worth $60. For breeding purposes, we own a pure-blood Ayrshire bull.

Interest and improvement are evident in agriculture generally, and the old prejudices against book farming retire more and more each day.

Norfolk Agricultural Society, Norfolk county, Massachusetts.

The Society was organized February 7, 1849, and chartered March 27, the same year. The payment of $5 each entitles to life membership. From the State, we receive $600 annually. Our property was valued, in 1857, at $10,414, invested in lands and buildings occupied by us, while we were indebted $5,800. Of late, this indebtedness has been considerably reduced. A Fair is held yearly, when the average amount paid for premiums is $775, the largest being as follows: $100 for the best conducted and most improved farm during five consecutive years; $25 for the best managed farm for the year; an equal amount for the best seedling potato; and $20 for the best 40 pounds of butter. We publish an annual volume of Transactions of about one hundred and fifty pages. The establishment of a library is now under consideration.

Agricultural Society in the County of Plymouth, Massachusetts.

The date of our organization was in 1819, and of our charter, June 11, the same year. The whole number of members is 550, all for life, each paying an entrance fee of $5. We receive $600 annually from the State, admission fees to the grounds and exhibitions, and occasional donations.

Our Society possesses 43 acres of land, with an exhibition hall 135 feet long, 60 feet wide, and two stories high, cattle stalls, pens, &c., costing about $17,500. A two-day Fair is held, once a year, in September, or October. About $1,300 are expended per annum for premiums, the largest being $50. From $50 to $100 per annum are paid for experiments. We plough for exhibition every year at our Fair grounds from 2 to 3 acres, and have a circular tract 30 feet wide and half a mile around. Our grounds are good for mowing and tilling. We publish annually a volume of Transactions, containing from seventy to eighty pages. Six hundred to eight hundred copies are printed, and each member receives one. Our library contains about one hundred and twenty-five volumes, valued at $100.

This Society is among the oldest of its kind in the Commonwealth. It has slowly, but regularly, grown in number and influence. Our county has heretofore been somewhat engaged in manufactures, but of late years more attention and interest have been given to agriculture. There is much less land now under cultivation than twenty-five or thirty years ago, yet the produce is larger. As our farmers diminish their number of acres, they have better fields and crops. The tools and implements of husbandry are greatly improved in number and variety; there is a marked change in the appearance of stock exhibited at our Fairs, and larger and better milkers and workers, mostly domestic, but few of foreign breed having been imported or reared in the county. We have endeavored to encourage the cultivation of grain crops, particularly Indian corn. Instead of the 20 or 30 bushels per acre formerly raised, we now have of the latter 40 or 50; and the average of all the other grains has been much increased. One of our farmers has just shelled the corn produced on a single acre, and found it to measure 103¼ bushels, and to weigh 5,716 pounds, equal to about 56 pounds to the bushel.

Hingham Agricultural and Horticultural Society, Plymouth county, Massachusetts.

This Society was organized November 10, 1858. Its present number of members is 168, each paying $1 at initiation; or $5 for life. Voluntary contributions add to our income. We have on hand $200. A Fair is to be held once a year. At our late fair $292 were paid for premiums, the largest being for working oxen and steers, $18; sheep, $16; swine. $18; Indian corn, $20; vegetables, $20; ornamental

trees, $12; cranberries, $24; other fruits and flowers, $20; and useful and fancy articles, $20.

A deep interest in agricultural improvement is manifested by the members, who are regular in their attendance at the monthly meetings. These are important to us as specimens of fruit, grains, and vegetables are presented at each, and an opportunity is afforded to test their quality, thus enabling us to judge from what varieties it may be best to cultivate.

Massachusetts Horticultural Society, Suffolk county.

This Society was organized and chartered June 12, 1829, and now contains about 700 members, each paying an initiation fee of $5, and $2 annually; or $20 for life. Our other modes of obtaining funds are from rents and a proportion of the receipts from Mount Auburn Cemetery. The present value of our real estate, stocks, &c., is about $85,000. We have an exhibition every week, and an annual Fair. About $2,500 are paid each year for premiums, the largest being $60 for the production of seedling pears, &c., superior to any previously cultivated. Experiments are made gratuitously for the Society by its own Professors. An annual Report of our transactions, including occasional papers, is published. Seven hundred and fifty copies are printed, consisting of from one hundred and fifty to five hundred pages. Our library contains two thousand volumes, valued at $4,000. We have a collection of models of fruits.

Great benefits have resulted from our labors. In this vicinity, horticulture and its kindred arts have been signally advanced. The Executive of our organization is composed of amateurs, whose services are freely rendered.

Worcester County Horticultural Society, Massachusetts.

This Society was organized September 10, 1840, and chartered March 3, 1842. It now has about 500 members, all for life, and each paying $3. From the rent of real estate, and admission fees to the annual exhibitions, we derive further funds. We possess land valued at $16,000, and furniture worth about $1,500. For premiums, we pay $200 per annum, the highest of from $1 to $6, being for the largest and best collections of apples, pears, and other fruits and vegetables. The Reports of the several committees of the Society at the annual exhibitions have been published, usually consisting of about fifty pages. Our library contains between four hundred and five hundred volumes, estimated at $1,000.

The influence of our Society has been very great throughout Central Massachusetts. A large number of the fine fruits have become familiar to our citizens, and there are hundreds of gardens and orchards within the proper territory of our Association now stocked with such choice varieties, which, previous to our organization, were known but to few beyond the vicinity of Boston.

Worcester, North, Agricultural Society, Worcester county, Massachusetts.

This Society was organized March 8, 1850, under the name of the Fitchburg Agricultural and Industrial Association, and chartered March 30, 1852, as the Fitchburg Agricultural Society, which latter name was subsequently changed to the present designation. We now have 525 members, each paying $5. The State appropriates annually $600 for our benefit. About $300 a year are received from admission fees to the exhibition; besides, we have donations and the income of our permanent fund. Invested in bank stock, notes, &c., we possess $3,800. An annual Fair is held, when from $600 to $700 are paid for premiums, in small amounts, each. For lectures, we pay from $5 to $10 a year. We have offered about $60 per annum for experiments, though the entire sum is seldom expended. Our Transactions are published annually, consisting of from one hundred to one hundred and fifty pages, and from seven hundred to eight hundred copies. We have no library except such volumes as we receive gratuitously.

The farmers in this vicinity find more interest than formerly in reading agricultural books from the various libraries to which they have access, subscribe to a larger number of rural publications, and are more attentive to lectures and the discussions of Farmers' Clubs. More care and skill are employed in breeding domestic animals, while crops of many kinds have increased in quantity and improved in quality. As to fruits and orchards, improvement is particularly marked.

Bolton Agricultural and Mechanics' Association, Worcester county, Massachusetts.

This Association was organized November 16, 1846. Its present number of members is 70, each paying an initiation fee of $1, and an annual sum of 25 cents; or $3 for life. Voluntary contributions by the members is another mode by which we obtain funds. We hold a Fair monthly, for the sale of live stock and farm produce. Premiums are sometimes offered for vegetables and the manufacture of manure. Our library consists of two hundred and fifty volumes, valued at $250.

The benefits resulting from this Association are derived from discussions at our weekly meetings in the winter, when we compare the different modes and experiments adopted by each other for farming, thus ascertaining the surest way of raising crops.

Leominster Farmers' and Mechanics' Association, Worcester county, Massachusetts.

This Society was organized October 25, 1852. The present number of members is 250, each paying $1 a year. We obtain other funds

by a dinner, or tea-party. Our treasury contains $425. An annual Fair is held, when from $200 to $300 are awarded as premiums, the largest being $5, each, for horses, bulls, and fat cattle. Some seasons, we have had four or five lectures for $50. Our library consists of one hundred volumes.

Before we had an Agricultural Association in this town, (for ours is only a town Society,) if a farmer produced 60 bushels of corn, 25 of wheat, and 20 of rye to the acre, it was regarded as incredible. Since the formation of our Society, products have increased from year to year, till now we have obtained on our stiff-soil, side-hill farms more than 40 per cent. above any crop of ten years ago. Our neat stock is being improved by the introduction of Durhams and selections of the best ordinary cattle for the supply of Boston with milk; Devons for working oxen; and Ayrshire for the dairy. The best stallions in the country are employed for the improvement of our horses. We procured a Suffolk boar, recently, and have raised a cross between that breed and our ordinary swine; the result is as fine samples as can be found in the State. The spring pigs are killed about the 1st of December, and weigh from 300 to 350 pounds each. By experiments on fruits, we have learned what are best adapted to our region. The apple is our staple, and the Baldwin the prince of pippins; the quince is a profitable fruit, and this town does a good share towards supplying Vermont. The pear is our poorest crop. Choice, hardy grapes are considerably cultivated.

Lexington Farmers' Club, Middlesex county, Massachusetts.

Organized November 21, 1854. Our Club now contains 50 members, each paying $2 initiation fee, and 50 cents annually. Other funds are obtained from subscriptions. We have held but a single Fair since our organization, when about $200 were paid for premiums, the largest being $3, each, for the best bull, milch cow, and horse. Our library contains three hundred and fifty volumes, valued at $500.

Semi-monthly meetings are held from November to April, for the discussion of various subjects pertaining to agriculture.

Lunenburg Farmers' Club, Worcester county, Massachusetts.

This Club was organized in the autumn of 1848, and the present number of members is 42, each of whom pays 50 cents initiation fee, and a like sum annually. Another mode of obtaining funds is by tea-parties, given by the ladies, who are our most zealous and faithful friends. The Club possesses property consisting of cattle-pens and fixtures, worth about $200, and $150 on hand.

We hold an annual Fair, which is not inferior to the county show, except in size. As to fruit, it would be difficult to surpass us. From $130 to $200 are expended on such an occasion for premiums, the

largest being $5 for the best acre of corn; and an equal sum for a yoke of oxen. We sometimes publish an account of the Fairs, with a list of prizes. Our library is but commenced, containing the Patent Office Reports.

The benefits resulting from this Club are—more attention to the rearing of better cattle, to the cultivation of wheat, corn, and fruit, and a general change in the aspect of the town. More than 100 bushels of corn have recently been raised on an acre, being a variety called the "Carter." The land had never been ploughed before, but has been used as a pasture for a hundred years. Thirty bushels of wheat and 300 of potatoes have been also raised to the acre.

Michigan State Agricultural Society.

This Society was organized March 23, 1849, and chartered April 2, the same year. It contains about 2,500 members, each paying $1 annually; or $10 for life. The State appropriates $2,000 a year for our benefit. An annual Fair is held, when about $3,000 are expended for premiums, the largest offered being $15 for essays, $12 for full-blooded bulls, and $12 for the best stallion for all work, trotting stallions, &c. We pay the expenses of a lecturer at the Fair, but nothing for the address. A volume of Transactions is published annually, consisting of seven hundred pages and two thousand copies.

The benefits resulting from our Society may be seen throughout the State. We cannot claim to possess so much good stock as some of the older States, but exhibitors now present superior specimens of horses, cattle, sheep, and swine. Improvement in every department of agriculture is evident, but in none more marked than in that of domestic animals.

Berrien County Agricultural Society, Michigan.

Our Society was organized September 6, 1851, and chartered February 9, the same year. Its present number of members is 472, each paying an initiation fee of $1, and a like sum annually. The payment of $10 constitutes life membership. Besides this, $250 are annually raised by tax in the county for our benefit, and voluntary subscriptions and donations in larger or smaller sums. Our real estate consists of a beautiful Fair ground at Niles, containing 7½ acres, well fenced, and with suitable buildings, purchased by the voluntary subscriptions of citizens of this town, which property is worth $3,000. Here an annual Fair is held, and premiums to the amount of $600 are awarded, the largest being as follows—$20 for the best stallion, $20 for the best pair of working horses, $20 for the best Durham and Devon bull, $10 for the best ten sheep, and $10 for the best lot of swine.

We have an address at each Fair, for which we pay. The amount

we expend for cuttings and seeds for distribution is from $50 to $200, annually. Our library contains one hundred volumes, valued at $250.

Since the organization of our Society, there has been a great improvement in horses, cattle, sheep, and swine; and in crops of various kinds, together with increased interest in all agricultural operations.

Branch County Agricultural Society, Michigan.

Organized and chartered October 17, 1851. This Society at present contains 530 members, each paying $1 initiation fee, and an equal sum annually. The charge for gate admissions furnishes additional funds. We own about 6 acres of land, valued at $1,500. An annual Fair is held, when $400 are paid for premiums, the largest being $10, for farms. A Report of our transactions is published each year.

The competition excited among our farmers has tended greatly to enlarge agricultural knowledge; and in horses and cattle—particularly in the Black Hawk and Morgan, and Durham and Devon—we have continued to improve.

Calhoun County Agricultural Society, Michigan.

This Society was organized February 12, 1855. The present number of members is 756, each paying $1 initiation fee, and an equal sum yearly. When $100 are obtained from members, the supervisors are required by law to raise an amount not exceeding one-tenth, and not less than one-fortieth of a mill on the taxable property of the county. We possess about 16 acres of land. An annual Fair is held, when $500 are awarded as premiums, the largest being $30 for the best essay on farming; and a silver cup, valued at $10, for the best improved farm. The prize list is generally small. Our transactions are published annually by the State Society. About one hundred volumes constitute our library, valued at $100.

An increasing interest is manifested in the Society. In addition to the information derived from an annual address, the farmers from the several towns impart useful hints to each other. The premiums offered collect together a fine display of domestic animals, and stimulate the utmost improvement in breeds. Much attention is bestowed on horses, as a good horse is always salable. Our wool clip, which is an important item with us, commands a higher price than any produced in the Eastern States. Swine escape disease in our climate, so fatal in others. Great improvement has been made in poultry. Our crops have increased in proportion, those of wheat especially, and 30 bushels are frequently raised to the acre. Indian corn is abundant, and enters largely into the consumption of the county. Potatoes, the past season, were few, but of an excellent quality, free from disease. Turnips and ruta-bagas flourish here, and these should be more generally cultivated. Barley of good quality is raised, but a large yield is seldom obtained. The soil and climate are adapted

to the culture of tobacco, and it is remarkable that so little attention is given to this product.

Cass County Agricultural Society, Michigan.

This Society was first organized August 17, 1850, and re-organized May 24, 1856. Each member pays an initiation fee of $1, and an equal amount annually. Other funds are obtained by subscriptions. We own 5 acres of land, with buildings, and have $430 in the treasury. An annual Fair is held, when from $400 to $500 are paid for premiums, the largest being $8 for the best Durham or Devon bull.

Our Fairs are well attended, and the exhibition of stock and farm produce is as good as many of the similar organizations in older and more thickly-settled counties.

Genesee County Agricultural Society, Michigan.

This Society was organized January 12, 1850. The present number of members is 623, each paying 50 cents initiation fee, and an equal sum yearly. An appropriation from the county and charges of admission, further increase our funds. We possess real estate valued at $2,000. An annual Fair is held, when from $400 to $500 are awarded as premiums, the largest being $10 for working oxen.

Interest and competion have been aroused, and superior cattle and cultivation have resulted. The annual ploughing matches instituted by us have also produced great improvement.

Hillsdale County Agricultural Society, Michigan.

This Society was organized January 10, 1851, by a general act of the Legislature. Our present number of members is 575, each of whom pays 75 cents per annum. Another mode of obtaining funds is from admission tickets (20 cents each) to the Fairs; also a tax of one-fortieth of a mill on taxable property in the county. We have grounds for exhibitions, leased for a term of years, where we hold an annual Fair, when from $700 to $800 are paid for premiums, the largest ever offered having been $10 and diploma, for the best improved farm of not less than 40 acres, to be determined by comparison of natural soil, with the application of different manures, the amount of product, capital employed, and profits obtained. We have a lecture at each Fair. This is generally published. Our transactions are included annually in the publication of those of the State Society, to which we are auxiliary; and these books, with the Patent Office Reports, form our library.

The benefits resulting from our Society pervade the entire county,

operating alike on all the different branches of agriculture, and are more marked, perhaps, in the improvement of stock than in any other feature. Ten years since, we were raising wheat almost exclusively, now mixed farming prevails; nine years ago, we had but one improved blood bull in the county. Now there is scarcely a neighborhood without several. And it is the same as to horses and sheep. Consequently, we have at present large meadows; and clover is restoring to our soil the nutriment which the wheat had taken from it. Fruit-culture is also eminently successful.

Ionia County Agricultural Society, Michigan.

This Society was organized September, 1853. The present number of members is 135, each paying an initiation fee of $1, and an equal sum yearly; or $10 for life. Further funds are obtained by the sale of admission tickets. A Fair is held annually, when about $150 are awarded as premiums, the largest being $10 for the best managed farm.

General improvement, especially in live stock, and better taste in building, mark the influence of the Society. We feel that we owe much to the action of the Patent Office, in seeds, cuttings, and inventions.

Jackson County Agricultural Society, Michigan.

Organized and chartered in 1852. This Society now contains 1,211 members, each paying $1 per annum. A tax on the county furnishes us with additional funds, which, in 1857, amounted to $613. We possess 13 acres of land, with the buildings and improvements worth, probably, $9,500. An annual Fair is held, at the last of which, $774 were awarded as premiums, the largest being $5. For lectures we expend $25. We publish a Report yearly, consisting of sixteen pages, and fifteen hundred copies.

Kent County Agricultural Society, Michigan.

This Society was organized in 1857. The present number of members is 300, each paying an initiation fee of $1, and an equal sum yearly; or $10 for life. A county tax further increases our income. We possess 34 acres of land, worth $4,000, and about $600 in cash. An annual Fair is held, when $300 are awarded as premiums, the largest being $10 for the best team of five yoke of oxen from one town. We pay a small amount for the annual address. Our transactions are published yearly by the State Society. About twelve volumes constitute our library.

More than usual interest is manifested in our association by the community, and prospects were never more flattering.

Macomb County Agricultural Society, Michigan.

Organized in 1849, and reorganized March 10, 1857. Our present number of members is 430. The initiation fee is $1 each, and the annual payment an equal sum. Donations and a tax of one-fortieth of a mill per cent. on the real and personal property of the county form our other modes of obtaining funds. We have now on hand $230. A Fair is held annually, when $600 are expended for premiums, the largest being $10 for the best horse, and an equal amount for the best bull. Lectures are delivered before us, but we only pay the expenses of the lecturer.

Since the formation of our Society, horses, stock, and sheep have much improved, and there is emulation to increase the fertility of farms. Though the county is small, and embraces a large tract of waste land, its stock is celebrated throughout the State, and our citizens have received a good proportion of the premiums bestowed by the State Society. Two years ago, all but one of such awards fell to our share. On that occasion the prizes were for field crops.

Monroe County Agricultural Society, Michigan.

This Society, organized June 14, 1849, now contains 550 members, each paying an initiation fee of 50 cents. For life membership, $10 are required. We obtain further funds from the county appropriation of three-fifths of a mill on real estate within its limits, amounting to $400. A Fair is held annually, when $300 are paid for premiums, the largest of which have been—$10 for the best, and $6 for the second best, improved farm. We possess a beautiful show ground of 12 acres.

A lively interest is manifested by our agricultural and mechanical community, and we are building on our ground an appropriate edifice, after the plan of the late New York Crystal Palace, smaller, of course, yet sufficiently large to accommodate 3,000 people. The condition of our farms is improving rapidly.

Ottawa County Agricultural Society, Michigan.

This Society was organized February 20, 1856, and at present numbers 114 members, each paying an initiation fee of $1, and an equal sum per annum. Our funds are further increased by a tax on all real and personal property in the county, as well as by gate charges. We possess 5 acres of land and about $150. An annual Fair is held, when $350 are awarded as premiums, the largest being $15 for the best improved farm, $10 for the second best, and $5 for cattle and horses. For lectures, we expend $25 a year. Five hundred copies of our Transactions, in pamphlet form, are published annually; but it is our intention to issue hereafter a book once every three years.

Agricultural improvement is evident since the formation of our Society.

Agricultural Society of the State of Minnesota.

This Society was organized January 4, 1854, and has at present about 500 members, each paying $1 initiation fee, and an equal sum annually. A Fair is held yearly, when about $600 are awarded in premiums, the largest offered being $25 for the best trotting horses.

Until within a year, we have had no thoroughly organized County Societies, and upon these depends, in a great measure, the success of a State organization. At present, however, there are several such associations, some of which have grounds of their own; and more satisfactory results may now be anticipated.

German Agricultural Association of Carver County, Minnesota.

This Association was organized March 2, 1856. We have 21 members, each paying, at initiation, $1, and $1 20 annually thereafter. No Fair has been held thus far. For experiments, we pay from $10 to $25 per annum. We have a trial-ground. From $10 to $25 are expended yearly for cuttings and seeds for distribution.

Although many experiments have been made, still a knowledge of the peculiarities of our climate is wanted to insure success.

Nicollet County Agricultural Society, Minnesota.

In June, 1856, our Society was organized, and at present has about 150 members. The initiation fee of membership is $1, and an equal amount annually. We have no other mode of obtaining funds, except the charge for admission to Fairs. We hold a Fair annually, but thus far have paid out little for premiums, consisting principally of agricultural publications. These have had a tendency to increase the interest originally created by our association, and to produce a desire for improved seeds, breeds of cattle, swine, sheep, and fowls. Several nurseries have been commenced.

Berlin Agricultural Society, Steele county, Minnesota.

Organized January 5, 1857. Our Society contains 88 members, each paying 25 cents initiation fee. No sum is fixed for annual payments, but funds for general purposes are raised by a tax on the members. Competitors for premiums are required to pay an extra

sum, which varies with the nature of the prize. A Fair is held every two years, but as the past season was unfavorable and the expenses would have been burdensome, it was deemed judicious to postpone the exhibition appointed for this fall till next year. We have therefore as yet paid no premiums.

Numerous experiments have been made by our members, principally in reference to native fruits, garden vegetables, and injurious insects, with satisfactory results, of which minutes are kept in the records of the Society. We have commenced a library. Its value at present is about $25.

The practical knowledge obtained at our meetings by interchange of views has made our field crops decidedly superior to those of the adjoining townships, while in gardens our superiority is astonishing. This is, in good part, owing to the seeds we have received from the Patent Office, some of which have proved especially valuable. The parsnips have grown over 2 feet long, and are excellently adapted to feed milch cows; while the peas, beans, and sweet corn deserve commendation. By studying the natural characteristics of the country, we have already learned some facts of value to agriculture.

It is, perhaps, worthy of mention that we have created an emulation among the boys, who are cultivating half-acre lots, each, in competition for the premium next fall.

Less than three years ago, the first settler entered this township.

Farmers' Club of Warren, Winona county, Minnesota.

This Society was organized January, 1856, and at present contains 42 members, each paying an initiation fee of 25 cents, and an equal sum annually; or $5 for life. Our funds are increased by contributions. An annual Fair is held, when the premiums consist of certificates of first, second and third best. We possess three young nurseries. Our transactions are published in the county paper. Thirty-five volumes constitute our library, estimated at $40.

Field crops have been much improved by the introduction of seeds by the Patent Office. All kinds of roots do well here, especially the Swedish turnip.

Wright County Agricultural Society, Minnesota.

This Society was organized in 1856, and at present has about 20 members, each paying $1.

It is only three years since the formation of this county, and for two of these, every crop has been nearly destroyed by locusts. Thus a disheartening feeling has prevailed throughout the community. Our Society, inaugurated with decided interest, is reduced to a mere name; but we still indulge the hope of reviving it, and, having the best of farmers among us, we trust to work well and profitably hereafter.

Boone County Agricultural and Mechanical Association, Missouri.

This Association was organized in 1852, and chartered in 1853. The present number of members is 250, each paying $5, annually; or $25 for life. Entrance fees to Fair grounds further increase our income. We have $6,000 in our treasury. An exhibition is held once a year, when about $1,500 are awarded as premiums, the largest being $50 for horses, cattle, jacks, mules, &c.

Ours is the oldest society in the State. It has been the means of giving this county a great reputation for fine stock. An interest has been excited among our farmers and stock-raisers, inducing importations of the best breeds of most of the domestic animals which are useful in this climate. The diffusion of knowledge on agricultural subjects, and the introduction of improved implements in the various mechanical departments, have likewise done much towards enlightening our community and increasing wealth.

North West District Agricultural Society, Buchanan county, Missouri.

This Society was organized June 10, 1855, and chartered in January, the same year. The present number of members is 213, each paying $25. The State contributes for our aid $500 annually. Our treasury contains $9,000. A Fair is held yearly, when from $2,500 to $3,000 are paid for premiums, the largest being $50, for stock, farm implements, agricultural products, &c. A list of these awards is published.

The benefits resulting from our Society have been in improved modes of culture, and superior live stock. Our Fairs excite interest, and are advancing the general prosperity.

Callaway County Agricultural Society, Missouri.

This Society was organized June 22, 1851, and chartered April 9, 1856. The present number of members is 164. An annual payment of $5 each is required, provided expenses are not defrayed by the exhibitions—if they are, nothing. For life membership the amount charged is $20. Other modes of obtaining funds are by gate charges, the per-centage from exhibitors on premiums competed for, interest on surplus money in treasury, and rent of grounds. We possess in cash from $600 to $800, and 10 acres of land. An annual Fair is held, when from $1,200 to $1,500 are awarded as premiums, the largest being $45, each, for breeding-stock, male and female; and $30 on mules. Though we have neither a nursery, trial-ground, nor experimental farm of our own, all three, belonging to private individuals, are at our disposal. We only publish our Transactions by particular order of the State Board, and then in the newspapers. An

importing company has been formed under our auspices, but as yet only one animal (a jack from Malta) has been introduced.

A marked improvement in the quality of cattle, jacks, and mules, is perceptible. This county being peculiarly adapted to grazing, more attention is given to that kind of stock which fattens readily on the spontaneous productions of the soil, matures early, and is fit for market at all times, than to any of slow development. Generally, there is no great increase in Cereals. Some new crops have been cultivated with success, especially the Chinese sugar-cane. This is a recently opened country, and, as is almost invariably the case, our farmers inclose more ground than they cultivate. A livelier interest, however, in agriculture is prevailing; and we have begun to experiment, and to try to produce more from less ground than formerly. Such are the depth and fertility of the soil that manures will not be required for years to come; but superior cultivation is desirable, and this is being accomplished, chiefly through the instrumentality of our Society.

Cass County Agricultural and Mechanical Association, Missouri.

This Society was organized March 1, 1855, and chartered February 24, the same year. The present number of members is 150. The amount required for life membership is $20. Further funds are obtained from gate charges, "sweepstakes," and booths. We possess 22 acres of land, worth $2,200. A Fair is held annually, when about $900 are awarded as premiums, the largest being $20, for "sweepstakes" in horses and cattle.

Live stock and other products of agriculture have improved. Domestic manufactures have made great progress.

Cedar County Agricultural and Mechanical Society, Missouri.

This Society was organized December, 1857, and chartered January 4, 1858. The present number of members is 110, each paying an initiation fee of $2 50 and an equal amount yearly. Gate charges and appropriations by the State and county further increase our income. We have a small piece of ground, only sufficient for the purposes of exhibition, and $200 in cash. At our late Fair $250 were awarded for premiums, the largest being $10. An annual exhibition will be held.

Beneficial results are confidently anticipated from our influence, as the soil is well adapted to the growth of all the grains and vegetables usually cultivated in this latitude; and most of the fruits flourish here.

Clark County Agricultural and Mechanical Society, Missouri.

The date of our organization was in 1853, and of the charter in 1854. Annual members pay $5; life members $30, each; of the latter there are 50. Persons competing for prizes pay one-third of the premium sought. We possess 10 acres of ground, inclosed with a high plank fence, where an annual Fair is held. About $2,000 are paid yearly for premiums. The largest offered wore $50 for the best ten acres of "bottom" corn, and $50 for upland. Liberal prizes were awarded for horsemanship, being the first of the kind; for ladies' work, and domestic manufactures, generally; and for mechanical work. The Fair is open for competition to all applicants. We had some fine Durham bulls at our last exhibition, and several superior stud horses. For the purposes of breeding, we have horses, horned cattle, and most other domestic animals.

The establishment of Fairs has tended much to improve our horned cattle. We cross principally with the Durham, and are getting a fine stock for the butcher, as well as good milch cows. With the Morgan, Black Hawk, and other celebrated breeds, we are also improving our horses; and our sheep with the Merino, Bakewell, Southdown, &c. Swine and poultry also receive due attention.

Clay County Agricultural and Mechanical Association, Missouri.

Our Association was organized April 5, 1854, and incorporated by the Legislature March 3, 1855. It has now 256 life members, each of whom pays $25 for this privilege. The receipts from annual members are about $300. We also obtain funds from admittance at the gate, amounting to about $1,400, from the State $100 annually, and from the rent of grounds and booths about $300 more. The possessions of the Association are 20 acres of land in the town limits, with improvements, worth $6,000, and nearly $1,500 in money. A Fair is held annually, on the first Wednesday of October, continuing four days. The Association pays $1,800, annually, in premiums, to which $150 are added by the President. The largest single premium, of $100, has been given for the best stallion; a like amount for the best improved and cultivated farm; and, this being a stock-rearing as well as a hemp-growing county, the next largest for horses, cattle, and other stock.

We expend but little for cuttings and seeds for distribution, most of the rare varieties being received from the Patent Office. Our Transactions are published annually, in pamphlet form, containing about twenty pages, and the issue consisting of four hundred copies.

The benefits of the Association are apparent, even in the few years since its incorporation. Zeal and activity are displayed in every branch of mechanical and agricultural labor; an increase in the amount, and a far greater improvement in the quality of every variety of stock; and, above all, the introduction of labor-saving machinery

and implements, enabling us to work better and at less expense. Our Fairs, also, are more numerously attended, there being frequently 8,000 visiters in a day; and on no day of the last Fairs less than 5,000.

Dade County Agricultural and Mechanical Society, Missouri.

This Society was organized January 8, 1858. Its present number of members is 185. The amount of initiation fee is $2 50, with an equal payment annually, to which the Legislature appropriates $100. We possess a Fair ground valued at $150, where a Fair is held once a year, when $384 are paid for premiums, the largest of which have been $10 and $12 for horses.

We have evidence of an increasing desire to excel in the rearing of domestic animals; and in this respect I do not doubt that our organization has been, and will be, of incalculable benefit to the farming community.

Gasconade County Agricultural Society, Missouri.

This Society was organized and chartered March 30, 1856. The present number of members is 90, each paying an initiation fee of $1, and $1 20 a year. We receive $100 per annum from the State Treasury, and possess four shares in a saving fund association, and five town lots. An annual Fair is held, when $160 are awarded as premiums, the largest being from $5 to $10 for various objects. For cuttings and seeds for distribution we expend money, from time to time, according to the means on hand. Our transactions are published in the county paper.

The principal produce here are barley, fruit, and wine, and our Fairs show a satisfactory progress in all, especially in the two latter. A knowledge of our native fruits and wines has been diffused, and the consequent demand urges our farmers to their best efforts.

Gratiot County Agricultural Society, Missouri.

The date of our organization was October 8, 1857, and the present number of members is about 50. The initiation fee is 50 cents each. An annual Fair is held.

Central Agricultural and Mechanical Society, Jasper county, Missouri.

This Society was organized May 8, 1858, and now contains 530 members, each paying an initiation fee of $2 50. Our funds are increased by voluntary contributions. We have leased, for ten years, 5 acres of land, well fenced, and set in blue-grass. Here

an annual Fair is held, when $1,000 are paid for premiums, the largest offered being $50.

Great benefits have resulted from our Society in the diffusion of agricultural knowledge, and especially in the improvement of animals. The increase of crops is considerable, and much interest is manifested in this respect throughout the county. Our prospects of doing good are indeed flattering.

Pike County Agricultural and Mechanical Society, Missouri.

Organized December 4, 1854, and chartered in 1855. Our Society at present contains 110 permanent members, besides those by the year. Of the former class, each pays $25, and of the latter, $5, the last mentioned sum being required annually. From our gate charges, fees for exhibition, rent of ground for shows, and refreshment stands, we obtain further funds. We possess real estate, valued at about $2,000. Once a year a Fair is held, when from $800 to $1,000 are paid for premiums, the largest being $25. Prizes are also awarded for the best horse, mare, jack, or jenny, mule, bull, and cow, and for superior manufacturing tobacco. We publish a statement of the premium list, and report of Fairs. Our library consists of Patent Office Reports.

There appears to be more evidence of improvement in horses, cattle, and mules, than in any other farm products. This results from the spirit of rivalry encouraged by our organization.

St. Charles Agricultural and Mechanical Society, St. Charles county, Missouri.

This Society was organized June 2, 1857, and chartered February 16, the same year. The present number of members is 112, forming a joint-stock company, the shares being $25, each. We also obtain funds from the gate fees, rent of booths, and charges for entering animals and articles for competition. Our possessions are 30 acres of land, fenced, where we hold an annual Fair, when about $600 are paid for premiums, the largest being $20 for the best blooded stallions, mares, geldings, &c. A statement of these prizes is published in our county paper.

The interchange of sentiments among our farmers on agricultural subjects has been the means of causing some, who otherwise would not have done so, to take and read publications on such topics, thus diffusing this important knowledge. Many have procured blooded stock of every kind, while general attention has been directed to the proper rearing and care of animals. The best manner of cultivating various crops is eagerly sought, and the good result may already be seen.

Amite County Agricultural Society, Mississippi.

This Society was organized in 1854, and chartered May 24, 1858. The present number of members is 123, each paying $1 initiation fee, and 25 cents per annum. We receive from the State $200 annually. Our treasury contains $150. A Fair has been recently held, by way of experiment, which succeeded so well that we shall have one yearly hereafter. The amount awarded for premiums was $128, the largest being $10, each, for the best bale of cotton, the best stallion, and the best pair of "buggy" horses.

Since our Fair, we have had great encouragement to persevere, and trust soon to assume an honorable place among agricultural counties.

Grenada Agricultural and Mechanical Joint-Stock Association, Yalabusha county, Mississippi.

This Society was organized January, 1858, and chartered February 6, the same year. The present number of members is 87. A share of stock is $50, which entitles to the privileges of membership. Our present funds amount to $6,000. A Fair is held annually, when from $1,200 to $1,500 is awarded as premiums, the highest being silver pitchers, worth $50 each, for a cotton-gin and the largest variety of fruit trees.

Considerable interest is taken in our efforts, and we confidently anticipate a useful career.

Oktibbeha Agricultural Society, Oktibbeha county, Mississippi.

Organized February 6, 1854, and chartered July 5, 1858. This Society has now 125 members, each paying an initiation fee of $3, and $2 annually. From the State $200 a year are received; and charges for admission increase our funds. We own an exhibition ground, and have $300 at interest. An annual Fair is held, when from $200 to $400 are paid for premiums, the largest being $10 each for the following objects: The best essay on reclaiming exhausted land; the best essay on plantation hygieine; best bale of cotton; greatest yield per acre of cotton, corn, &c.; also on stock.

The beneficial results of our Society are numerous. The most enterprising and successful farmers are brought together, who communicate their observation and experience in agricultural matters. A laudable ambition to excel is elicited.

Cass County Agricultural Society, Nebraska Territory.

This Society was organized August 30, 1856, and chartered January 26, the same year. Its present number of members is 177, each

paying an initiation fee of $1. An annual Fair is held, when $125 are paid for premiums, the largest being $5, each, for horses, mules, and cattle.

The people of the county manifest much interest in the Society.

Cheshire County Agricultural Society, New Hampshire.

The date of our present organization was October 5, 1854, and we have now about 1,000 members, each paying a fee of 50 cents at initiation, and an equal sum annually. By the sale of single tickets, at 25 cents each, we obtain further funds. Twenty-six acres of land, with Mechanics' Hall, and other buildings, constitute the property of the Society, valued at $4,000. A Fair is held once a year, when about $800 are paid for premiums, the largest, $25, being for the best conducted farm.

We are at present holding meetings in different sections of the county, at which lectures are delivered at the expense of the Society.

Grafton County Agricultural Society, New Hampshire.

This Society was organized in 1848. The members subscribe only for a year, and the number varies, being from 200 to 400. Our funds are increased by the sale of tickets of admission. An annual Fair is held, when from $200 to $350 are awarded for premiums, the largest being $20, each, on farms, and on town teams of twenty yoke of oxen; and $10 respectively on the best stallion and the best bull. We expend from $20 to $30 a year for an address. This is published in pamphlet form; and, in the newspapers, a list of prizes, judges, officers, &c.

Agricultural knowledge is advanced, and better crops and animals are produced. Mechanics are encouraged to excel each other. Generally, the Society is a decided benefit to the county.

Souhegan Agricultural and Mechanical Society, Hillsborough county, New Hampshire.

The date of our organization was May 1, 1856. We have 130 members. A fee of 50 cents, each, is paid at initiation, which, added to the charge for admission to the Fairs, forms our fund. The treasury at present contains $75. We hold a Fair once a year, when $130 are paid for premiums, the largest being $5, on farms, $4 on cattle, ploughing, &c., $3 on working oxen, &c. Our transactions are published in the newspapers, and in the Reports of the State Society.

Only four small towns are embraced in our Society, and but few of the farmers take much interest in agricultural associations. Yet we see evidences of increasing attention. Stimulated by the meetings,

and Fairs of this Society, some of our most enterprising farmers have purchased pure-blooded animals for the purposes of breeding.

Rockingham Fair, Rockingham county, New Hampshire.

This Society was organized October 28, 1853, and now contains about 500 members, each paying $5, which entitles to life membership. The funds are increased by private subscriptions, entries for premiums, and admittance fees at the exhibitions. Our treasury has $1,700. A Fair is held yearly, when about $600 are awarded as prizes, the largest being $20 for ploughing. We have usually paid $5 for the best stock of any kind, and for the best crops; also, $10 for the best farm, and $5 for the best varieties of fruit. For lectures, $20, per annum, are expended. A volume of Transactions has been published, consisting of ninety-five pages.

A general improvement in the management of farms, and more interest in agriculture, have been the result of our organization. Root crops receive greater attention than formerly, and improved breeds of cattle have become more common. Under-draining is adopted to some extent.

German Agricultural Society of Livingston, Essex county, New Jersey.

This Society was organized April 5, 1857. The present number of members is 14. At the monthly meetings, each pays from 10 to 25 cents, according to requirements. Our library consists of several English and German agricultural books and papers, including the Patent Office Reports.

Benefit has resulted from the conversations and discussions at our meetings, and an increased zeal has manifested itself since we have entered into connection with the Patent Office. Of the seeds received from that source we would especially recommend the produce of the ruta-baga, or Swedish turnip, as being the best adapted to our locality, excellent for table use, and the most profitable for market; also, the red-topped turnip, which is cut and treated like sour-krout.

Producers' and Consumers' Association of Metuchin, Middlesex county, New Jersey.

This Association was organized November 2, 1857, and has now 39 members, each paying an initiation fee of 50 cents. By voluntary contributions, we obtain other funds. No Fair has yet been held, but it is determined to hold one annually. There is no fixed sum for lectures, but $50 were expended for this purpose last year. Newspaper reports of our transactions have frequently appeared, always exciting general interest in the vicinity.

Stimulated by reports of two of the members last winter, namely, one of an experiment in growing corn, and the other a series of experiments in cultivating roots, several gentlemen at our late meeting represented an increase of from 20 to 45 per cent. in the corn crop; and a root crop, more than five times the average, has been cultivated in our section, with satisfactory results.

Salem County Agricultural and Horticultural Society, New Jersey.

This Society was organized March 16, 1850, and chartered February, 1854. The present number of members is 327, each paying $1 initiation fee, and an equal sum yearly. Admission charges to exhibitions further increase our funds. An annual Fair is held, when about $900 are awarded as premiums, the largest being $20 for the best trotting horse, or "filly," and an equal sum for the best four steers. A silver cup, valued at $10, was also presented for the best six dairy cows.

A large quantity of land has been lately reclaimed, and drainage and good management have made what were recently swamps among the most productive of our arable lands. In addition to this, a constantly increasing amount of special manures is applied to the soil, so far promoting its fertility that the average product of the county, since the last Census, may reasonably be estimated at 10 per cent. greater. Another circumstance is rapidly adding to the productiveness of our county. As families grow up, or land owners die, large properties are subdivided. Thus, in place of large plantations but poorly cultivated, we have small farms more thoroughly worked and improved. One-half of a farm, under this superior culture, is now actually producing larger crops than the whole yielded before its subdivision. It is gratifying to witness in all parts of the county unmistakable evidences of the prosperity of its farming interests. Commodious dwellings and capacious barns are rapidly multiplying. More care is taken to provide for the wants of animals and make them comfortable. Stinting stock of any kind, either in food or shelter, is the worst possible economy; and it is undoubtedly true that it costs more to keep animals in a half-starved condition than to feed them well. Our greatest want is communication with the market during winter, or when ice renders our steam-boats useless. The amount lost every year in this manner would probably build and equip a railroad.

New York State Agricultural Society.

This Society was organized February 16, 1832, chartered April 26, the same year, for twenty years, and renewed March 16, 1852. At present, we have—life members, 208; honorary, 48; annual, 77; and at each Fair about 2,000 temporary members are added. An initiation fee of $1 is paid by each, and an equal sum yearly, if continued, or $10 for life. We receive from the State $700 annually, and for each

of the last five years $1,000 have been appropriated for carrying on the "Entomological Survey" of the State. At the autumn Fairs, we obtain usually about $2,000 from members and exhibitors, and from $7,000 to $14,000 from visitors, who do not become members, and are admitted for 25 cents each. Our treasury contains $2,650. An annual Fair is held, but not in the same place consecutively, and also a yearly meeting at the capital for the exhibition of winter grains, fruits, dairy products, and samples of crops, for which premiums are offered, being $8,000, though only between $6,000 and $7,000 are paid. The largest prizes have been $600 for surveys of counties. One thousand dollars are allowed to the Entomologist of the Society for his annual services. We have no regular lectures. Professor Johnston, of England, was employed, in 1850, to deliver a course before our Society and Legislature, at an expense of about $600. We offer premiums for experiments to the amount of $1,400, including prizes for farms, and $500 for surveys of counties, according to our means. Most of the seeds and cuttings distributed by us are received in exchange. Our cash outlays for this purpose are small. Much good is accomplished in this manner, and at our winter meetings, the prize grain is usually disposed of for seed, the result of which has proved beneficial. Our Transactions are published annually, from materials prepared and furnished by the Society, averaging about eight hundred pages, octavo, and from eight thousand to twelve thousand copies. The library comprises upwards of two thousand volumes, and a thousand or more pamphlets, valued in the aggregate at $5,000. We have a museum, consisting of implements, both ancient and modern, casts of animals, domestic poultry, specimens of grains and seeds, grasses, weeds, paintings and engravings of stock, tools, models of fruit, &c. This establishment excites great attention, attracting thousands of visitors annually.

The advancement made in this State, since the establishment of public exhibitions by this Society, in 1841, is most encouraging. In every department of our agriculture, there has been improvement, that of cattle, horses, sheep, swine, and poultry being most marked; and we can now favorably compare with any part of the world. Our wealth has thus been greatly increased. In implements and machinery of agriculture, we have progressed in a most gratifying manner. Many visitors at our Fairs remarked that, had the Society done nothing else than to secure the improvement in implements on exhibition, the State would have been amply compensated for all the outlay which had been made to promote agriculture. The dairy interest, one of the most important with us, has improved more, perhaps, than any other, and in no small degree through the direct influence of our agricultural associations. The quality of much of our butter is unequalled, and every year adds to the number of those who manufacture the choicest article. Under-draining, which is the foundation of good husbandry, in most sections of our State, is extensively introduced, and with decided advantages, the prejudices against it rapidly passing away.

It has been the object of our Society, in all its recommendations

to the farmer, to begin experiments upon a moderate scale, so that if, from any cause, a failure should follow, no serious disaster would be the result. We have thus undoubtedly enlisted more men in the cause, fewer disappointments have occurred, and the advance has been more rapid, than might otherwise have been experienced.

The number of agricultural associations in this State, in addition to the State Society, is—

County Societies	60
Town and minor, or Farmers' Clubs	60
	120

There are besides many horticultural societies in the State, which are accomplishing much good, especially in the production of choice fruit, and this to so great an extent that, in certain seasons, this crop is classed among the most profitable.

Alfred Agricultural Association, Alleghany county, New York.

Organized April 18, 1855. Our Association has at present 30 members, each paying 50 cents initiation fee. Constitutionally, an equal sum is required of each, per annum, but this has been occasionally dispensed with by a vote. We expend nothing for experiments, these being performed gratuitously. Our library is composed of thirty-five volumes, valued at $85.

It is customary at each meeting of our Association to select some subject for consideration at the next, and, when the question seems more favorable to that course, to name two members to lead a discussion, in which all participate. Much information is thus derived, and a general interest in rural affairs excited, which cannot fail to produce good results.

Rural Agricultural Society, Alleghany county, New York.

Organized February 7, 1857. Our Society now contains 98 members, each paying an initiation fee of 50 cents, and 25 cents annually. We hold a Fair yearly, at the last of which, we paid about $00 for premiums, the largest being $4 each, for the best matched horses and oxen. Our transactions are published in the county paper.

Conewango Agricultural, Horticultural and Mechanical Society, Cattaraugus county, New York.

The date of our organization was May 13, 1856. We have at present 50 members. An initiation fee of 50 cents is required of

each, and an equal sum annually, while $10 entitle to life membership. At our annual Fair, from $15 to $23 are paid for premiums. We have a library consisting of thirty volumes, a donation from the State.

The plan of this Society is designed to economize and to make the expense light to its members by free admission to the Fairs. The opinion has long been entertained by us that town organizations for agricultural purposes suit the convenience of the farmer more nearly, and are consequently the most advantageous. The result, thus far, has proved us in the right, although we contended against strong prejudices at first. We have seen a decided improvement consequent upon making our Society the medium for the distribution of books, seeds, &c., as the quantity and quality of garden vegetables have improved, and more attention has been bestowed on domestic animals, new systems of cultivation, and general management of farms.

Cayuga County Agricultural and Horticultural Society, New York.

This Society was organized June 21, 1856. The present number of members is 431, each paying $1 initiation fee, and an equal sum yearly. Voluntary contributions furnish additional funds. The amount in the treasury is $53, and we possess grounds containing about 19 acres, which, with the buildings, are worth $6,000. An annual Fair is held, when $700 are awarded as premiums, the largest being from $15 to $20 for live stock.

The benefits of the Society are seen in the general competition among its members.

Chemung County Agricultural Society, New York.

This Society was organized August, 1846. The present number of members is 211, each paying $1 initiation fee, and 50 cents a year. Receipts of show-room and admission charges to the grounds furnish additional income. An annual Fair is held, when about $300 are awarded as premiums, the largest being $5. Various sums are paid for lectures, and about $50 per annum for experiments. Our transactions are published each year in the county newspapers. We have a number of agricultural works, but scarcely to be dignified by the name of library.

We are obtaining much better domestic animals, and the crops are increasing both in quantity and quality.

Columbia County Agricultural Society, New York.

This Society contains 1,243 members. Each pays, at initiation, $1, and an equal sum annually; or $10 for life membership. From the State appropriation and the rent of grounds, we obtain further

funds. We own 15½ acres of land, with buildings and fixtures, valued at $5,500. We hold a Fair yearly, when $825 are paid in premiums for the general objects of agriculture. We expend $20 annually for a lecture.

The only means we possess of diffusing a knowledge of rural affairs is by distributing among our members the Transactions of the New York State Agricultural Society, and those of the American Institute, from which may be obtained all the experiments made, and the improvement of different kinds of stock, the use, mode of manufacture, and preservation of manures, with their adaptation to different soils, the reclaiming of lands by drainage, and the introduction cf superior fruits. Stock has improved. A rivalry exists to produce and exhibit the best breeds.

Erie County Agricultural Society, New York.

The date of our organization was in 1841, and the Society chartered in February of the same year. It contains about 300 members. The amount required for life membership is $10, while the Legislature appropriates $186. An annual Fair is held, when from $400 to $800 are paid for premiums. We have, on three occasions, published yearly Reports of our transactions, about a thousand copies each time.

Our knowledge of agriculture and the rearing of stock improves. Farm implements are also better.

The Fruit Growers' Society of Western New York, Erie county.

This Society was organized in 1855. The present number of members is 140. An initiation fee of $1, and the annual payment of a like sum, are required; or $10 for life membership. Two or three Fairs are held in a year. We published a volume of our Transactions in 1856, of one hundred and forty pages.

Our Society is one of an exclusively pomological character, devoted to the advancement of fruit-culture within the natural division of the State known as Western New York, embracing all the counties lying west of, and including, Onondaga. Its meetings are held three or four times a year, at Buffalo or Rochester, and are usually well attended. It has done something to promote the objects in view by its classification and exhibition of fruits, its recommendation of superior varieties, by its discussions upon various subjects of importance to the fruit-culturist, and by the general spirit of emulation which it is infusing among the agriculturists and horticulturists of this portion of the State.

Essex County Agricultural Society, New York.

This Society was organized in December, 1850, and at present contains about 400 members, each paying $1 a year. We obtain

annually from the State about $70. A yearly Fair is held, when the amount awarded as premiums varies, though it is usually $500. The largest ever offered was $30 for the best farm. We expend $30 per annum for lectures. Our library consists of the Transactions of the State Society and of the American Institute of New York.

There has been a steady improvement in farming, and, owing to the exertions of this Society, draining, deep ploughing, the application of the rich vegetable deposits of our mountain bogs, and of the refuse, finely-powdered charcoal from our iron forges, have been employed with good effect. Some of the most famous horses in America have been reared in this county, among which the celebrated trotting stallion, "Ethan Allen," is an instance. We have also introduced Devon cattle, and fine specimens of that breed may now be found here, though the Durhams are still generally preferred. But few sheep are raised, and yet the formation of the county and its climate are eminently adapted to them, both as to their health and fineness of wool. The consumption of hay in the winter months by the large number of horses and mules employed in our lumber and iron business, and the absence of an extensive turnip or root culture, may account for this neglect.

Greene County Agricultural Society, New York.

This Society was organized and chartered October 11, 1856. There are 200 members, at present. The terms of membership are—$1 initiation fee, with a like sum annually, and for life membership $10. Funds are also obtained from the State, and from admission fees to the grounds. A Fair is held once a year. The amount paid for premiums, annually, is about $518, of which $8, for the best team of working oxen, is the largest. Twenty-five dollars is our annual payment for lectures. Our transactions are published in the newspapers. The principal benefits we have experienced are the information conveyed relating to animals and grains, the methods of increasing the productiveness of the soil, and improvement of breeds of stock, besides the greater care and exertion on the part of the farmers generally, stimulated by the success of their more careful and enterprising neighbors.

Greene Farmers' Club, Greene county, New York.

Our Club was organized February 2, 1856, and chartered on the 16th. It has at present 58 regular members, and others at the time of the annual Fair; each paying an initiation fee of $1, and a like sum annually. By voluntary subscription and sale of articles donated, our funds are further increased. We generally hold a Fair twice a year, in the spring for sales, and in the fall for exhibitions. About $100 are paid for premiums. The largest has been $5, for horses and cattle.

We think the assembling of farmers at regular intervals, even if not oftener than once or twice a year, of benefit; and in addition our Fairs have sales connected with them, to which all persons, whether members or not, are invited, thus affording facilities in disposing of stock and other articles. The competition for premiums also gives farmers an interest in improving their stock, fruits, and all other crops, while our exhibition of implements draws attention to new tools and machinery.

Farmers' Club of Little Falls, Herkimer county, New York.

Organized March 21, 1857, and chartered in January of the following year. Our present number of members is 50, each of whom pays an initiation fee of $1. Funds are also obtained by taxation. We hold a Fair annually; but only diplomas have as yet been awarded. For the past year, we paid for lectures $30. A volume is now in the course of publication embracing our essays and reports of discussions. It will contain about four hundred pages. Our library consists of sixty volumes. We have a small collection of models of agricultural implements, fences, specimens of soil, &c.

Meetings are held twice a month, when essays are read and the subjects discussed by members. These contributions to knowledge are published regularly in two weekly papers of the largest circulation in the county, thus being generally disseminated. Seeds, cuttings, &c., are exchanged and gratuitously distributed.

Jefferson County Agricultural Society, New York.

This Society was organized October 25, 1817, under a general law of the State. The present number of members is 806, each paying an initiation fee of $1. By the sale of exhibition tickets to persons, not members, we further increase our income. We possess a lot of 14 acres, which, with three good buildings, cost $4,000. An annual Fair is held, at the last of which $1,067 were paid for premiums, the largest being $40 for the best cultivated farm of 50 acres, or more. We only pay the travelling expenses of a lecturer. Our proceedings are published each year, in a pamphlet of from thirty to forty pages.

The benefits resulting from this organization are apparent in the mode of preparing and cultivating the soil, in the better taste and judgment displayed in buildings, and in farm management generally. Through our visiting committee a salutary influence has been exerted in stimulating attention to the manufacture of the products of the dairy in this county, which stand high in the market when compared with the mass that finds its way to New York city, the great butter and cheese emporium. The premiums offered have also, no doubt, awakened a livelier interest in improving farm stock, by the introduction of improved breeds and judicious crossings.

Livingston County Agricultural Society, New York.

Organized July 1, 1841, and reorganized June 30, 1855. This Society now contains 850 members, each paying $1 initiation fee, and an equal sum annually; or $10 for life membership. An appropriation is made for our benefit, each year, by the State; and we also receive voluntary contributions. We lease the Fair grounds, but have erected buildings on them at our own cost, being over $2,000. Here an exhibition is held annually, when from $700 to $1,000 are paid for premiums, the largest offered having been $10, for the best specimen of wheat bread, with recipe for making it. Our transactions are published in the same volume with those of the State Society.

The most apparent benefits resulting from our organization are found in the improved crosses of cattle.

Niagara County Agricultural Society, New York.

This Society was organized in January, 1856, and chartered December 2, 1858. At present, we have about 1,000 members, each of whom pays $1 annually. The amount required for life membership is $10. Our other modes of obtaining funds are by the Fairs, and entrance fees to grounds for persons and carriages. We possess 20 acres of land, with buildings for exhibition, and offices at two gates, all inclosed with a fence 6 feet high, and valued at $6,000. An annual Fair is held, with spring shows and sales. The average payment, per annum, for premiums, is $800, the largest we have offered being $40 for the best ploughing by boys under eighteen years of age. For lectures, we expend $20 annually. A Report is made yearly to the State, which is published in the Transactions of the State Society.

The great benefits of this Society are the opportunities afforded its members, and others, of learning what has been done, and how it has been accomplished.

Our county is now in a transition state from grain-growing to stock and fruits. Until about four years since, we almost exclusively produced wheat for exportation. Then, the farmer thought of nothing but raising all he could of this grain, and getting his pay for it. Owing to the ravages of the weevil, wheat has been rendered worthless for the past four years. The loss was attempted to be supplied by the cultivation of barley, yet the crops even here have become short. We are at last convinced that our country is better adapted for stock, dairying, and fruit; and by attention to these, we are satisfied that the county will soon be wealthier than if wheat-growing had continued. There is now more stock here, and of a superior quality, than could have been found in any three years previous to 1857. We have, for several years, shipped our fruit to the West, and the demand is greatly in advance of the supply. So prospectively fair is that trade, that thousands of apple trees are yearly set out, also

quinces, peaches, and grapes. Our sales of pork, this season, are three times greater than before, and as pork and mutton are soonest increased, they are the first that show the change in the character of our products for export.

We are peculiarly situated for rearing stock, our county lying between the lakes. The climate is the most uniform in our latitude, and our position high and healthy. We can send our cattle from grass in good order to New York, which cannot be done from any section of country west of us, and thus the necessity of stall feeding is obviated. Our grass season is long enough for cattle to get fat and keep so, even through dry weather—a peculiarity not existing either to the eastward or westward of us. As an instance: On the 1st of April I bought cattle, put them to good grass during the season, and sold them this fall at double the cost, and yet beef was then selling at $4 50 and $5 per hundred. This, too, has been called a dry season, and unfavorable for grass.

Orleans County Agricultural Society, New York.

This Society was organized and chartered October 17, 1856; but an association under the same name and for the same general purposes has existed here for the last eighteen years. Our present number of members is 489, each paying an initiation fee of $1, and an equal sum yearly; or $10 for life. We obtain further funds by admission charges, and rent of stands and stalls. Our real estate consists of 12 acres of land, with buildings, valued at $2,500; and we have cash on hand $150. Fairs are held twice a year, the first a horse exhibition, and the second for miscellaneous articles. From $400 to $600, per annum, are awarded as premiums, $10 being the largest, which is for the best cultivated farm of at least 50 acres. For annual addresses we pay from $10 to $25. Our transactions are reported to the State Society.

Farms are gradually improving in thorough cultivation. Our cattle, horses, sheep, and swine are better.

Skeneateles Farmers' Club, Onondaga county, New York.

The first organization was as "The Skeneateles Agricultural Association," in 1837, and the present, in December, 1854, as the "Farmers' Club." Our existing number of members is 43, each paying an initiation fee of 50 cents, and an equal sum annually. We obtain other funds by voluntary contributions. A Fair is held yearly. At the first exhibition, we adopted the plan of charging no entrance or admittance fee, and paying our premiums with diplomas, which is attended with less expense, and gives general satisfaction. About three hundred and fifty of these testimonials are distributed at each exhibition; and we believe this system the best that can be adopted. Our lectures are delivered gratuitously. The Transactions of the

Club at their stated meetings (weekly in the winter and monthly after) are published in the village paper the succeeding week. This paper has a circulation of about one thousand copies. The annual Reports of the Secretary and Treasurer generally appear in the same journal. Our library consists of one hundred and forty volumes, valued at about $200. We have also an agricultural museum, embracing samples of farm products, minerals, &c. A collection of birds and animals has been loaned to the Society.

Much has been done by our weekly meetings and annual Fairs in creating a friendly feeling among the citizens, particularly the agricultural portion, and also in increasing a rivalry to obtain and rear the best herds of stock, to produce the largest crops, and to excel in the neatness and convenience of farms and buildings. Feeding and wintering stock also receives more attention. The assessment shows that our farms have greatly advanced in value. About sixty or seventy agricultural papers are taken here, and a large number of others, wherein a considerable space is devoted to this interesting subject.

Oswego County Agricultural Society, New York.

On the 1st of February, 1840, this Society was organized as an association of farmers, having no corporate powers. It was reorganized and incorporated December 27, 1855, under a general law of the State. Our members are all yearly, and usually number about 700. An annual payment of $1 is required. Besides the fund thus collected, we have the admission money received at the gates during Fairs, &c., from $600 to $1,000; from the State fund for promotion of agriculture, $131, annually; and from rent of grounds, during the year, for other purposes, $150. We possess 14 acres of land, with fixtures, buildings, water-works, &c., costing originally $3,375. A Fair is held yearly, and sometimes an exhibition of mowers and reapers. We pay in premiums, annually, about $600 in cash, and $200 in books. The largest we have ever offered were—$20 for horses, showing style and speed; $10 for stallions; and $100 aggregate to each of the three following breeds of cattle: Durhams, Devons, and Ayrshires. We pay nothing for lectures, except for the annual address; nor anything for experiments, except premiums sometimes given on gardens and farms, when experiments are taken into account. A pamphlet of from twenty to fifty pages, containing usually the Transactions of the Society, Annual Address, and such other matter as circumstances render necessary, is published each year, consisting of about one thousand copies.

Some of the benefits resulting from our Society are—the information derived from "Statements" required from successful competitors in various branches of agriculture, and from a comparison of notes and ideas upon other topics of interest, at the annual Fairs; increased atten-

tion to the introduction of choice breeds of domestic animals, fostered and encouraged by premiums, and by the publicity which is then given to the superiority of these animals; the more rapid introduction and diffusion of labor-saving machinery; increased incentives for thorough tillage by the award of premiums upon field crops, and the consequent notoriety of successful competitors; and the advantages derived from the discussion of agricultural subjects, as manures, drainage, soils, ploughing, fruit-culture, &c.

Otsego County Agricultural Society, New York.

This Society was organized January 22, 1856. The present number of members is 280, each paying $1 initiation fee, and an equal sum yearly; or $10 for life. We obtain further funds by admission charges to grounds. In cash, we possess $2,000; and have a lease on 8 acres of land. Two Fairs are held a year, and for premiums $1,250 are awarded, per annum, the largest being $10 for horses and cattle of various breeds. Our Transactions are published annually, making a pamphlet of about forty pages.

Putnam County Agricultural Society, New York.

This Society was organized in 1851, under a general act of the Legislature. We have at present 250 members. The annual payment is $1, and the amount, each, for life membership, $10. A small sum is received from the State. We possess tents and fixtures for Fairs to the value of $500, besides $200 in the treasury. Twice a year we hold Fairs—in fall, as a general show; in winter, for dressed meats, grain, root crops, &c. From $300 to $500 per annum are paid for premiums, the largest being $50, for the best essay on farming as applied to this county written within it. We publish our proceedings in the county newspapers. Our library contains a number of volumes.

Much benefit has arisen from this Society, considering the brief period of its existence. It has promoted an honest rivalry among many of our farmers, both in reference to the cultivation and products of their lands, and in the rearing of horses and cattle.

Queens County Agricultural Society, New York.

This Society was organized November 30, 1857, under a general law. The present number of members is 753, each paying $1 a year; or $10 for life. Further funds are obtained from the State appropriation of $91 annually, from subscriptions, and from admission charges at the gates. We have on hand $913. A Fair is held yearly, when

$670 are awarded as premiums, the largest being $25 for the best stallion, and $10, each, in most of the classes of cattle, horses, vegetables, and fruits. The transactions are published by the State Society, though we publish our addresses, about a thousand copies of each, varying from twelve to fourteen pages.

We have distributed one thousand, nine hundred and sixty-three volumes of valuable books on subjects connected with agriculture, horticulture, and the mechanic arts. The benefits resulting from our Society may be seen in the improved stock, both of cattle and horses, more abundant crops, a greater variety and superior quality of vegetables, a general diffusion of intelligence, and a happy yearly re-union, when our farmers compare notes, exchange opinions, and become united in the agricultural improvement of the county.

Rensselaer County Agricultural Society, New York.

This Society was organized and chartered July 8, 1841. Of annual members we have 542; of life members 309, the former paying an initiation fee of $1 each, with a like sum yearly—the latter $10. For admission to our Fairs a charge of 12½ cents is exacted of each visitor not a member, and $1 for a carriage containing 4 persons.

We own 7 acres of land, situated in Lansingburgh, with extensive buildings, which cost the original proprietor about $13,000, and for which, the Society paid $5,000. A portion of the latter sum was a donation from this town. In addition to the above, the Society leases 4 acres of land, which is inclosed, making 11 acres in all. A Fair is held once a year. About $2,000 per annum are paid for premiums the largest ever offered, on grain crops and cattle, being $25. Our transactions are occasionally published at the expense of the Society, including the address at the Fair. An annual Report is always presented to the State Agricultural Society, and published in their proceedings by order of the Legislature. A large room was obtained, last May, in the city of Troy, for the occupancy of the Secretary, and the permanent establishment of a library, where, also, we have commenced the formation of a museum.

A gradual improvement is perceptible in the whole industrial and moral condition of this part of the State. It may be remarked that this, the first County Society organized under the act of 1841, has been in successful operation ever since, has collected and disbursed $30,000 or $40,000, and now expends $3,000 annually in the promotion of agriculture and the mechanic arts. As to the improvement of domestic animals and crops, we have not statistics for the comparison of the past years; and it has been suggested that a record be kept of the annual amount of products, with drawings and paintings of animals and vegetables, and bound in volumes of convenient size for reference. This, while tending to cherish the arts and an appreciation of the beautiful, would form a valuable addition to agricultural libraries.

International Agricultural and Mechanical Society, St. Lawrence county, New York.

Organized and chartered June, 1856. This Society now contains 685 members, each paying $1 initiation fee, and an equal sum annually; or $10 for life membership. We obtain further funds from gate charges, ground rent, and use of seats. Our possession at present is 100 acres of land, with a course a mile in circumference. A Fair is held here once a year, when about $1,200 are paid for premiums. We expend $50 annually for an address.

In the breeds of cattle, the Ayrshire has proved the greatest producer, with the amount of feed required, an important matter in a climate where it is necessary to house the stock six months of the year. The greatest quantity of butter made from a cow in a week was $18\frac{3}{16}$ pounds, from grass alone. We have a spontaneous growth of white clover upon our commons, which not only gives flavor to the butter, but doubtless is a preserving quality; for, when manufactured, it will retain its sweetness for a year or more in a temperature of 60°F. The smaller breeds of domestic animals are most suitable to this climate.

Saratoga County Agricultural Society, New York.

This Society was organized and chartered June 24, 1841. The present number of members is 400, each paying 50 cents initiation fee, and an equal sum yearly; or $5 for life. A State appropriation, admission charges to Fair grounds, and registry fees for entering articles further increase our funds. An annual Fair is held, when about $400 are awarded as premiums, the largest being $15 fcr five yoke of oxen from town. We pay from $10 to $20 for the annual address. A full Report of our transactions is published each year in the county papers, and an abstract sent to the State Society, by which it is inserted in the yearly volume.

There are always some new implements, or varieties of plants or grains, to be seen at our Fairs, and farmers are ready to obtain whatever novelties on exhibition may appear useful.

Schoharie County Agricultural Society, New York.

Our Society was organized and chartered under a general act of the Legislature, passed May 5, 1841. Each member pays $1 per annum. Our other mode of obtaining funds is from the State, which annually contributes $97, provided the Society shall first obtain a like sum. Once a year, a Fair is held, when the amount expended for premiums varies according to the number of paying members, but it has never been less than $180. The awards have been from

$5 to $10, for horses, cattle, and sheep. Lectures are delivered gratuitously, either by a member, or by an invited guest. Reports of our transactions are sent to the State Society. Books for distribution as premiums are furnished us by the same association.

We think our progress in agricultural knowledge is perceptible in fences, farm buildings, depth of ploughing, and under-drains, with the display at exhibitions.

Schuyler County Agricultural Society, New York.

This Society was organized March 14, 1855, and chartered at the same time, under the general law. Its present number of members is 329, each of whom pays an initiation fee of $1, and a like sum annually. The amount required for life membership is $10. Our other modes of obtaining funds are by tickets of admission and donations. An annual Fair is held, at which $210 are paid for premiums, one of $6 being the largest, and bestowed for the best farm and ploughing. Twenty dollars a year are paid for lectures.

Since the establishment of this Society, great improvements have been made in the various classes of farm stock. Choice specimens of the best breeds of sheep and swine have been introduced, the good results of which are already manifest. The making of butter and cheese is largely increased.

Tioga County Agricultural Society, New York.

This Society was organized August, 1855, under a general law of the State. The present number of members is 300, each paying $1 initiation fee, and an equal sum per annum; or $10 for life. From the State, we receive each year $61. An annual Fair is held, when about $400 are awarded as premiums, the largest being $8 on horses, and $6 on working oxen. We make a Report to the State Agricultural Society, by which it is published.

The improvement in domestic animals is evident; and much interest is felt in the production of grain.

Wayne County Agricultural Society, New York.

This Society was organized May 15, 1855, and chartered May 2, the same year. The present number of members is 700, each paying $1 per annum; or $10 for life. Rent of refreshment stalls and seats, and admission charges to the grounds, furnish additional funds. We possess 17 acres of land, worth $3,000. Fairs are held twice a year. The amount paid annually as premiums is about $1,500, the largest being $100 for the best horse, in the qualities of speed and action. From $10 to $50 per annum are paid for experiments. Our Transac-

tions are published yearly, making a pamphlet of about thirty-two pages, of which two thousand copies are printed.

Warren County Agricultural Society, New York.

This Society was organized February 17, 1857, and at present contains 110 members, each paying an initiation fee of $1, and an equal sum annually; or $10 for life membership. The subscription of the town in which the annual exhibition is held, and fees for admission, furnish us with additional funds. We have a lease for three years of Fair grounds. At the yearly show, we pay for premiums $150, the largest being $100 and $50, each for farm improvement. Our Transactions are published annually, in a pamphlet of about twenty pages.

A marked progress has resulted from the influence of this Society, especially in the community surrounding the village of Luzerne. Regular weekly meetings are maintained for the discussion of practical subjects, thus stimulating the young farmers to a more thorough and enterprising system of tillage.

Washington County Agricultural Society, New York.

The date of our organization was in 1841, under the general statute. We have at present 271 members. An initiation fee of $1 is paid by each, and the amount required for life membership $10. The Legislature appropriates $123 annually, provided the same amount be collected by the Society.

We hold a Fair twice a year—in September, as a show of stock, farm and horticultural products, fruits, flowers, vegetables, mechanical and domestic manufactures, &c.; and in January, for farm products not matured at the time of the previous Fair. From about $350 to $450 are paid per annum for premiums, in accordance with the means obtained, and somewhat depending on the location of the exhibition. The largest we have ever offered were—$10 for lady equestrianship, in one instance; $6 for the best stud horse; $5 for the best Durham bull; and a like sum for the best Devon bull. The prizes, though small, are numerous, that they may be widely diffused. Competitors appear satisfied with much work and little pay. Our Transactions are published annually in one or more of the county newspapers. All books received are distributed as premiums.

The influence of the Society is illustrated annually by an increase of knowledge in agriculture, a higher state of cultivation, drainage of lands, the reclaiming of barren patches, selection of seeds, and more care in rearing blooded stock, besides the improvement of fruits and flowers. The gardeners in the county have contributed to the interests of the Society by exhibiting extensive varieties of vegetables and supplying the community with choice seeds.

Mount Vernon Horticultural Society, Westchester county, New York.

Organized February 24, 1855. Our Society at present contains about 60 members. The annual payment of each member is $1 50. A charge is also made for admission to the exhibitions, which pays incidental expenses. Fairs are held in June and October, about the last of each month. For premiums each year, $75 are expended, two classes of these being formed, and adapted to each subject of reward. Their value is about $1 and 75 cents, respectively. The premiums awarded have been in the form of books, those having reference to the subjects for which they were awarded being generally given. Where several prizes were due to one person, a book, the more valuable, was selected. The cost of these premiums ranged from 50 cents to $5 each. The number of volumes in our library is seventy-five, and their value $60. Lectures are occasionally delivered. They have proved highly interesting and instructive. Plants, cuttings, and seeds have been distributed. The Patent Office seeds and others have been neatly put up in papers, bearing the label of the Society, which have been presented at the meetings, and have proved acceptable. Our exhibitions have been creditable, and the order and tasteful appearance of our village gardens, decoration of court-yards, ranges of ornamental and fruit trees, &c., give evidence of the beneficial influence of the Society. Next in interest, but not less instructive, have been the conversational meetings, which, for some time, were held weekly. Questions arising among amateur horticulturists always have ready answers, and valuable experience is made common property. Nearly all the details of horticulture have been discussed, and practical applications made.

White Plains Horticultural Society, Westchester county, New York.

This Society was organized May 28, 1855. The present number of members is 75, each paying $1 50 initiation fee, and an equal sum yearly. Admission charges to exhibitions further increase our income. We hold Fairs in May, June, July, August, and September. For prizes $100 per annum are awarded, $5 being the largest, for the best spading. Our library contains fifty volumes, valued at $125.

Horticulture has made an important advance, especially with regard to the smaller fruits and flowers. A general interest prevails and a desire for the greatest possible improvement.

Farmers' Club of Lewisborough, Westchester county, New York.

This Club, which is auxiliary to the Agricultural and Horticultural Society of Westchester County, was organized December 23, 1851, and now has 40 members. The annual payment required is 25 cents,

or, constituting membership in both Societies, $1. Ten dollars entitle to life membership in the Club. We have not held any Fairs, but occasionally meet for a trial of mowing machines, that the farmers may see the mode of working of various implements at the same time. Several lectures are delivered before us in the course of the season, but we generally succeed in procuring them at little expense. All the books we have obtained have been distributed among the members as gifts.

Our addresses have excited inquiry. Frequent discussions of the merits of suggestions therein contained have increased the attention of our farmers, and, among other results, led to the making and saving of manures. A large quantity of muck is now employed where, before the formation of this Club, but little was used, and consequently the recent crops exhibit a great improvement. Agricultural knowledge has been diffused by the distribution of the Patent Office Reports, by those of the State Societies, and of the American Institute of New York. Our members have also been much benefited by the Patent Office seeds.

Wyoming County Agricultural Society, New York.

This Society was organized in 1844, and chartered in 1857. The present number of members is 200, each paying $1 initiation fee, and an equal sum yearly; or $10 for life. An appropriation by the State and charges for admission to the grounds furnish additional income. We possess 10 acres of land, well inclosed. An annual Fair is held, when about $200 are awarded as premiums, the largest being for the best horses, cattle, and sheep, as well as for butter and cheese. The amounts have always been small, not exceeding $2 and a diploma, owing to the debts of the Society. We usually pay $30 for an address, each year.

Probably more has been accomplished in improving breeds of cattle than in any other respect.

Tonawanda Valley Agricultural Society and Farmers' and Mechanics' Association, Wyoming county, New York.

This is a voluntary Association, having no charter from the Legislature, and organized July 4, 1856. Our present number of members is 750, each paying 50 cents initiation fee, (juvenile competitors, 25 cents,) and an equal sum annually. By admission fees to the grounds, contributions, and donations, we increase our fund. We own a tent and fixtures, 120 by 32 feet, costing $175. An annual Fair is held, when the cash premiums amount to $300, besides which, books and diplomas are awarded. The largest we have offered was $10 for cattle; and, in one instance, that amount on a single fat animal. For lectures, we have only paid some small amounts. We use for our Fairs about 20 acres of land, belonging to a member. Here there is a

beautiful natural grove, an abundant supply of water, and a good half-mile track for the trial of horses. We distribute a large number of books as premiums, and though we have no library we are contemplating the establishment of one, with a museum, &c.

Our prize books have awakened a new interest and opened a new field of thought and investigation. Familiar conversations, at the monthly meeetings, and occasional lectures, have advanced practical agriculture. There has been a gradual improvement in stock throughout the country for a number of years, but it has been more rapid and apparent in this vicinity, of late. Within the last year, many animals of full blood have been introduced from the imported herds of the Breckinridges, in Kentucky. We entertain the assurance that this stock was brought here through the influence of our Association.

Ohio State Board of Agriculture.

This association was organized and chartered in February, 1846. The Presidents of County Societies are ex-officio members. There are now eighty-two County Societies in this State. Ten members elected by and from among these Presidents constitute the "Acting Board." The Corresponding Secretary has no vote. All the show licenses collected throughout the State, also all the proceeds over $600, arising from sales of escheated lands, are annually appropriated for us by the Legislature. The revenue from the two sources has averaged $3,000 a year for the past five years. Receipts of Fairs further increase our income. We have now on hand about $1,000. An annual Fair is held, when about $6,000 are paid, out of $8,000, the whole amount offered for premiums. The largest awarded is $100, for the best herd of cattle, consisting of a bull and four cows. We publish a volume of Transactions each year. The number of copies is determined by the Legislature, and, in 1857, was twenty thousand—one-fifth in the German language. Our library is composed of exchanges with other agricultural societies. An appropriation of $300 has been made for the purpose of commencing a library of standard works on rural affairs. We have, by way of a museum, several models of implements, and some minerals and mollusca of the State.

Adams County Agricultural Society, Ohio.

This Society was organized in 1851. The present number of members is 527, each paying $1 initiation fee, and an equal sum yearly. We obtain further funds by charges for admission to the Fairs. Our grounds consist of 5 acres, which, with improvements, are worth $1,500. An annual exhibition is held, when $600 are awarded as premiums, the largest being $8, each, for the best horse, stallion over four years old, horse for "all work," best acre of corn. and best acre of hay.

Before 1851, but little attention was given to agriculture, although this is among the oldest counties of the State. A large portion of our people were engaged in the lumber business. A great change has occurred, and a general interest in farming is now evident. Science and experience have proved that hundreds of acres of land in our county, lately deemed worthless, deserve to be ranked, with proper cultivation, among the most productive. That our Fairs have diffused a spirit of improvement is beyond a doubt.

Ashland County Agricultural Society, Ohio.

Organized and chartered in 1850. Our Society contains 250 members, who pay $1 each at initiation, and an equal sum annually thereafter. We receive $119 from the county. A Fair is held once a year, when about $400 are paid for premiums, the largest of which is $6 for stock.

The improvement of various kinds of stock is the most important benefit derived from our Society.

Ashtabula County Agricultural Society, Ohio.

Organized and chartered in 1846. Our Society at present contains 300 members, each paying an initiation fee of $1, and an equal sum per annum. Admission to Fairs and a grant from the county furnish us with other funds. We possess 4 acres of land, with buildings, all valued at $800. We hold an annual exhibition. In 1858, we paid for premiums $615, the largest being $10 for the best bull, and a similar sum for the best cow, irrespective of breed and age. The county papers publish our transactions.

Domestic animals have greatly improved through the influence of our Society, and the same may be said of butter and cheese. At present, the latter are our largest exports. More agricultural papers are now subscribed for and read, than ever before.

Belmont County Agricultural Society, Ohio.

Organized January 27, 1838. Our Society now contains 1,214 members, each paying $1 initiation fee, and an equal sum annually. From the State, we receive $173. A Fair is held every year, when about $1,000 are paid for premiums, the largest being $50 for the best thorough-bred stallion. Until this season, nothing had been paid for lectures, but we have just given $100 for a service of this kind.

The Fairs of this county have inspired the farmers with a desire to improve their stock and to cultivate their land in a better manner. There is now pure-blooded stock owned in the county, though before the establishment of the Society, we had none.

Clark County Agricultural Society, Ohio.

This Society was organized January 25, 1840, and reorganized and chartered February 12, 1853. The present number of members is about 1,200, each paying $1 initiation fee, and an equal sum annually. Our treasury contains $5,800. We hold a Fair yearly, when $800 are paid for premiums, the largest being $60. An abstract of our transactions is published annually. There are fifty volumes in our library, valued at $150.

The benefits resulting from this Society are a decided improvement in our agriculture, especially in horses and cattle. On Short-Horns, most of the premiums awarded lately by the State Board have been taken by our county.

Clermont County Agricultural Society, Ohio.

Our Society was organized in 1847, under a general law of the State. The present number of members is 788, each of whom pays $1 a year. We also obtain funds by voluntary donations. In real estate, we possess 30 acres of land, worth, exclusive of fixtures, $100 per acre, all inclosed by a board fence 7 feet high. We hold a Fair annually, in September, when about $550 are paid for premiums. Our premiums on farms and farm implements are liberal; also for cattle and horses, the highest being given for cattle. We sometimes pay $25 per annum for lectures, but they are generally delivered gratis. About twelve hundred copies, for gratuitous distribution, of a pamphlet Report, containing eighteen pages, are published by us annually, embracing a list of premiums offered, our regulations, &c.

The advantages of this Society are seen all over the county, in nearly every branch of agriculture, and more especially in the improvement of our stock of cattle and horses.

Cuyahoga County Agricultural Society, Ohio.

Organized January, 1846. This Society has now from 800 to 900 members, each paying $1 initiation fee, and an equal sum per annum. The sale of admission tickets furnishes us with additional income. We at present possess about $500 in cash. A Fair is held yearly, at which from $600 to $700 are paid for premiums, all of them being small, and the largest awarded for stock. We publish annually our Transactions, consisting of twenty-four pages, and fifteen hundred copies.

The benefits resulting from our Society have been the adoption a higher standard of agricultural education, of a more thorough cultivation of the soil, with improved implements, the rearing of only those breeds of stock which are best adapted for our purposes, and by maintaining a cordial feeling between farmers and mechanics. These have been the means of incalculable good.

Darke County Agricultural Society, Ohio.

The date of our organization was November 27, 1852, under a general law for the encouragement of agriculture, passed February 28, 1846. The present number of members is 400. A payment of $1 each, annually, is required. The Society receives $200 from the county treasury every year under the above recited act, and also about $300 for daily tickets, from persons not members, at the annual Fair, which is held in September. About $400 are paid for premiums. The largest offered were, $6 for the best stallion, four years old and upwards; $6 for the best stallion or mare of any age; $6 for the best bull or milch cow of three years and upwards; $8 for the best managed farm; $8 for the best acre of wheat; $8 for the best acre of corn; $6 for the best acre of oats; $6 for the best acre of barley; and premiums in proportion for other seeds, vegetables, &c. A Report of transactions is published annually in the newspaper.

No one who has given attention to the agriculture of this county since the formation of our Society will deny a marked improvement in all its branches. Tillage is much more thorough; swamp lands which were deemed worthless have been reclaimed by draining, and are now most productive; some of the best qualities of stock have been introduced, and the value of all others advanced; farm implements are of improved construction, fencing is better, buildings are remodelled, and the general thrift and tidiness of the farms increased. Our late exhibition, in all its departments, equalled any former one, and in some things decidedly excelled, especially in the show of stock, owing to the introduction of pure-bred animals. In domestic manufactured articles, it was creditable, and gave indications of renewed interest in the prosperity of our Society.

Defiance County Agricultural Society, Ohio.

This Society was organized March 25, 1848, and has now 65 members, each paying an initiation fee of $1, and an equal sum per annum. We receive an appropriation from the State, and certain fines, &c. A Fair is held yearly, when about $110 are awarded as premiums, the largest being for the best cattle and horses, and for improvement of the same. Our library consists of thirty-one volumes, valued at $40.

The quality of cattle, horses, sheep, and swine, has been much improved, and we now possess Short-Horns, Devons, and their crosses. The Morgan stock and heavy draught horses have been introduced. A great increase in the average yield of crops per acre is also seen, owing to deep tillage, draining, and subsoiling.

Cincinnati Horticultural Society, Hamilton county, Ohio.

This Society was organized in 1844, chartered in February, 1845, and now contains about 600 members. The initiation fee is $3 each, the annual payment being $2, and the amount required for life membership $20. Public exhibitions furnish us with other funds. We hold a Fair semi-annually, when about $700 are expended for premiums, the largest offered having been $100 for the discovery of an effectual remedy against the depredations of the curculio. We publish each year three thousand copies of a volume of our Transactions, containing about fifty pages. Our library has four hundred and seventy volumes, besides fifteen serial publications, all valued at about $2,000.

The benefits resulting from the operations and influences of this Society are obvious to all who have observed its career. Through its instrumentality, in a great degree, Cincinnati has become one of the wine-marts of the world. Its fruit market, perhaps, is second to none on this Continent, both for summer and winter-keeping varieties. The culture of the strawberry has been crowned with success; while the vegetable supplies are of a superior order in quality and variety. Rural embellishments have kept pace with our progress.

Hardin County Agricultural Society, Ohio.

This Society was organized February 14, 1851, and chartered February 28, 1846. It numbers at present 120 members, each paying $1 initiation fee, and an equal amount yearly. Charges for admission to the Fairs further increase our income; and the Society is entitled to receive from the county treasury a sum equal to that contributed by the members, each year, for the purpose of purchasing our site for exhibitions. This ground is worth $1,000, and is now nearly paid for. An annual Fair is held, when about $75 are awarded as premiums, the largest being $3, each, on stallions, brood mares, and improved breeds of cattle. No publication is made, other than that of the prize list; but we report our transactions yearly to the State Board.

More interest is manifested to reduce farming to a science. This we attribute, in great part, to the character of some of our premiums, which are agricultural papers. The rearing of a better stock of domestic animals engages attention.

Oberlin Agricultural and Horticultural Society, Lorain county, Ohio.

This Society was organized in 1835, and contains at present about 100 members, each paying an initiation fee of 25 cents, and an equal amount yearly. We obtain further funds by contributions. A Fair

is held annually. Our library yet numbers but few volumes, though we expect soon to increase it.

Our association is only for the benefit of the township, and is consequently small; still, its operations have been beneficial in diffusing information and improving farms and buildings. It has proved particularly useful in encouraging the production of a variety of fruits. Domestic animals, also, give evidence of well-directed care. In the winter season, weekly meetings are held for lectures, reports, and discussions, which are numerously attended and profitable.

Farmers' Club of Avon, Lorain county, Ohio.

This is a township society, and was formed in 1856. It has at present about 100 members. Each family competing for a premium pays $1, and other funds are obtained by subscription. An annual Fair is held in September, when $40 are awarded as premiums.

The benefits resulting from our Club are seen in the blooded stock of several kinds, and in better wheat, grasses, and vegetable crops.

Madison County Agricultural Society, Ohio.

Organized March 10, 1852. Our Society now contains about 500 members, each of whom pays $1 per annum. The proceeds of our Fairs furnish additional income. We own 8½ acres of land, on which, once a year, a Fair is held, when from $700 to $900 are awarded for premiums, the largest being $15 on horses and cattle.

The benefits derived from this Society may be estimated by the interest taken in its exhibitions by our farmers and mechanics, who use their best efforts to surpass each other in farm produce and machinery.

Miami County Agricultural Society, Ohio.

This Society was organized and chartered in September, 1846, and at present contains 1,090 members, each paying an initiation fee of $1, and an equal amount per annum. Our funds are further increased by the sale of tickets. An annual Fair is held, when $600 are paid for premiums, the largest being $15 for the best farm. We pay $150 for horses, $120 for cattle, $100 for farm and garden products, and an equal sum for mechanical productions. Our library consists of three hundred volumes, valued at about $400.

For the last twelve years, the value of domestic animals has trebled, and improvement is going on in all branches of agriculture and horticulture. Thorough cultivation of the soil and breeding from the best stock are becoming usual in this county. All these effects we attribute, in a great measure, to our Society.

Monroe County Agricultural Society, Ohio.

Under a general law, this Society was organized in January, 1850. Its present number of members is 121. An initiation fee of $1 is required of each, and a like sum yearly. Each County Society of this State receives from the county treasury an amount equal to that paid by the members, provided the same shall not exceed $200 to each county, nor half a cent to each inhabitant. We hold a lease of 5¼ acres of land for ten years, renewable at the expiration of the term, for which we pay $50 per annum. The date of this lease is January 1, 1859. A yearly Fair is held, when about $250 are expended for premiums, the largest being $20 for cattle and sheep. The awards of our committees and a list of prizes are published in the county papers.

Since the organization of our Society, much more attention has been given to the various branches of agriculture, and decided improvements have been the result with regard to domestic animals, in general, cattle, in particular. Our advance is less manifest as to crops, but the soil is better tilled, and we may safely anticipate success.

Morgan County Agricultural Society, Ohio.

This Society was organized February 14, 1852, under a general law. The present number of members is 577, each paying $1 initiation fee, and an equal sum yearly. We receive $200 per annum from the county treasury, and other funds from the rent of our grounds, admission to shows, and from restaurant licenses during exhibitions. We possess 6 acres of land. An annual Fair is held. The amount awarded as premiums, in 1858, was $750, the largest being $6, on horses, cattle, asses, and mules.

The beneficial results are plainly visible in the improvement of the Fairs, and in the general and increasing interest taken in these displays by all classes. Cattle, horses, sheep, swine, &c., are better; and an extensive assortment of farm implements has been introduced. Labor-saving machinery is more sought after, manuring more practised, and rotation of crops more generally adopted. The product is larger.

Muskingum County Agricultural Society, Ohio.

This Society was organized January 21, 1848, under a general law. The present number of members is about 500, each paying an initiation fee of $1; or $25 for life. We obtain further funds by gate charges. Our grounds consist of 15 acres, a part of which is inclosed. An annual Fair is held, when $600 are awarded as premiums, the

largest being $10 on live stock. The prize list and awards are published in pamphlet form.

The most prominent benefits are—the improvement of live stock, especially cattle; the varieties of wheat introduced; and superior farming and market gardening. The latter branch is promoted by the weekly meetings in summer, when premiums are awarded for the best fruit and vegetables.

Pickaway County Agricultural Society, Ohio.

This Society was organized February, 1851, and chartered June 26, 1858. The present number of members is 300, each paying an initiation fee of $1, and an equal sum yearly. Admission charges to exhibitions increase our funds. We possess 19 acres of land, with improvements, all valued at $5,000, and $500 in cash. A Fair is held annually, when from $600 to $1,000 are awarded as premiums, the largest being $20 for thorough-bred cattle. We have also paid $150 in prizes at equestrian exhibitions, but such are not held at the time of regular Fairs. Twenty-five dollars have been paid in some instances for lectures. We only publish our proceedings in the county papers.

Improvement in the rearing of stock has become more general, while the introduction of machinery, through our Fairs, has increased the quantity of crops. Cattle, swine, and corn, which are our three great staples, as a general thing, so absorb the smaller agricultural interests that no marked progress is otherwise made.

Portage County Agricultural Society, Ohio.

This Society was organized in 1845, under a general law, and at present contains 267 members, each paying $1 initiation fee, and an equal sum yearly. We have a lease of 15 acres of land, with fixtures, for ten years, from January 1, 1859. An annual Fair is held, when from $400 to $500 are expended for premiums, the largest being $6, each, for the best bull and best stallion. We report every year to the State Board, giving the condition and transactions of the Society.

From the time of organizing, we have distributed agricultural books and periodicals as premiums. The last three or four years, the amount thus awarded has been about $125 per annum. This has increased knowledge and awakened an interest unfelt before. There has also been a decided improvement in cattle and horses, and live stock, generally, have been more advanced than crops.

Edinburg Agricultural Association, Portage county, Ohio.

Ours is expressly a township Association. It was organized in January, 1856, and at present has 250 male members. No initiation or other fee is required, but merely the signing of our Constitution,

as most of us belong to County and many to State Societies, and the object of this Association is simply to combine our influence and good works for the benefit of the township. We have, therefore, no mode of obtaining funds but by voluntary subscription. An annual Fair is held in September, and an exhibition of fruits and seeds in January. The award of first and second premiums, though not in money, we consider sufficient incentive to exhibit, and have found it successful; in one or two instances, our Fairs having surpassed those of the county, both in the number of entries and superiority of articles. Lectures by gentlemen eminent in science and literature are frequently delivered before us, and always gratuitously. Though we have no library, as an Association, yet every member is a subscriber to some agricultural journal. At our organization, three years ago, the farmers of Edinburg were indifferent as to a high standard of agriculture; indeed, many were dissatisfied with their farms, or with the vocation, and selling out, to go West, or to change their occupation. Something was evidently wrong. But the result of our enterprise was immediate and wonderful; a spirit of interest and emulation pervaded the community; in spite of hard times, real estate advanced in value; and emigration suddenly ceased. The improvement of domestic animals, also, is now occupying our attention, and p. ans are being matured to introduce the best breeds during the coming season.

We are glad to acknowledge our obligations to the Agricultural Division of the Patent Office for many packages of choice seeds. The deep interest each member has taken in cultivating and preserving these has made a great improvement in our vegetable department, besides enabling us to maintain the incentive of action.

Putnam County Agricultural Society, Ohio.

This Society was organized February 3, 1855, under a general law. The present number of members is about 50, each paying an initiation fee of $1, and an equal sum yearly. Other funds are obtained from a county tax. An annual Fair is held, when about $90 are awarded as premiums, the largest being $5, each, for the best stallion, best pair of matched horses, and best acre of wheat. No library properly belongs to the Society, but we have what is called the "Township Farmers' Club," with library attached, containing one hundred and twenty volumes, valued at $110. These are for the use of the Club alone. Meetings are held monthly. Each member pays from 50 cents to $1 per annum, all of which is expended in the purchase of books. This institution is decidedly beneficial.

From the commencement, we have paid our premiums in agricultural books and papers, thus circulating a large amount of desirable knowledge, all of which has had its effect on the care given to animals and the raising of crops.

Sandusky County Agricultural Society, Ohio.

Our Society was organized in 1851, and chartered February 28, 1846. It now has 358 members, paying $1, each, initiation fee, and an equal sum annually. Charges for admission to our exhibitions further aid the funds. We possess Fair grounds and improvements, valued at $3,000, where the annual show is held, at which from $250 to $600 are paid for premiums, the largest being $15, for the best farm. A Report of our operations is published yearly. Thorough-bred cattle were introduced by us into the county, and we have kept a Short-horned bull for the benefit of the Society.

We have suggested many improvements in agriculture and breeding, which have resulted beneficially.

Trumbull County Agricultural Society, Ohio.

Organized in 1845. Our Society now contains 250 members, each of whom pays $1 per annum. The proceeds of our Fairs furnish additional funds. Our treasury at present possesses $600. A Fair is held every year, when $500 to $600 are paid for premiums, the largest being $20 for stallions and bulls. We only pay the expenses of our lecturers; the addresses themselves are always gratuitous. Our transactions are published yearly in the same volume with those of the State Agricultural Society.

The benefits resulting from our organization are manifest. The cattle and horses of our county have improved to such a degree that they now stand high at State Fairs, at home and abroad, and the superiority in "crosses and grades" among cattle is even more marked than in "thorough-breds."

Warren County Agricultural Society, Ohio.

This Society was organized December 1, 1849, under the general law. The number of members is 1,300, each paying an initiation fee of $1, and an equal sum yearly. The State gives us according to our population—at present $128 per annum—and we charge for admission to the grounds. We have on hand $300, and possess a seven-year lease of 22 acres of land, with improvements, worth about $2,000. An annual Fair is held, when $800 are awarded as premiums, the largest being $30 for the best conducted experiment of an eighth of an acre of Chinese sugar-cane, with the product in molasses or sugar; and $25 for the best essay on farming, to exhibit the largest return for capital invested, without depreciating the value of the land. We have paid from $25 to $50 per annum for lectures. Our transactions are not published; though two of the addresses have been. About fifty volumes constitute our library, valued at from $50 to $75.

A marked improvement may be seen in cattle and horses, as well as in implements and modes of farming. At the late Fair, 300 horses were entered, mostly fine animals; 22 bushels of wheat in as many lots; and thirty-three lots, of a bushel each, of corn in the ear. A member exhibited fifty-three varieties of corn, as he claims, all distinct, but not named.

Wayne County Agricultural Society, Ohio.

Organized November 17, 1849. Our Society now contains between 500 and 600 members, each paying $1 annually. We receive each year from the "State Agricultural Fund" $165, and the sale of tickets furnishes about $300 more. Our possessions in funds, real estate, and personal property, amount to $1,200. An annual Fair is held, when from $600 to $800, in money, are paid for premiums and agricultural papers and magazines. Our largest prizes are for stallions, cattle, and machines, usually $6 each.

Stock-farming, and the mechanic arts, generally, have improved.

Williams County Agricultural Society, Ohio.

This Society was organized June 14, 1856, and at present contains about 260 members. Each of these pays an initiation fee of $1, and an equal sum annually. We receive $50 from the county funds, admittance fees during the exhibition, and a sum from the lease of our grounds. We hold an annual Fair, when about $250 are awarded in premiums, the largest being $10 for female equestrianship.

A feeling of ambition has arisen among our people, which must ultimately result in great and permanent good to every interest here Blooded animals, of the domestic breeds, have been introduced, and are now being crossed upon the common stock. The average yield of crops has increased.

Wyandot County Agricultural Society, Ohio.

This Society was organized January 3, 1852. The present number of members is 275, each paying an initiation fee of $1, and an equal sum yearly. Our funds are increased by subscriptions and gate charges. We possess 8 acres of land, valued at $800. A Fair is held annually, when about $300 are awarded as premiums, the largest being $4 for blooded horses and thorough-bred cattle.

A gradual but decided improvement in domestic animals has resulted.

Pennsylvania State Agricultural Society.

This Society was organized January 10, 1851, and chartered March 29, the same year. There are at present 300 life and 2,500 yearly

members, each of the former paying $10, and of the latter $1. We obtain $2,000 per annum from the State Treasury. Our Sociey has $3,000 on hand. A Fair is held yearly, when from $4,000 to $7,500 are paid for premiums. Four volumes of our Transactions have been published. Our library contains five hundred volumes, valued at $500. This Society is not authorized to possess domestic animals for the purposes of breeding.

The benefits resulting to agriculture from the organization of our Society may be witnessed all over the State, in improved tillage, superior stock, and better knowledge generally.

Beaver County Agricultural Society, Pennsylvania.

Organized March 10, 1853, and chartered April, 1854. Our present number of members is about 600. Each of these pays an initiation fee of $1, and an equal sum annually thereafter. The amount of our funds at this time is about $2,500. A Fair is held every year, when from $800 to $1,000 are expended for premiums, the largest offered being $520 for stock.

It is to be regretted that our Society can furnish no further information, as, until the last few years, no record was kept of its transactions.

Bucks County Agricultural Society, Pennsylvania.

This Society was organized December 4, 1843, and chartered September 16, 1857. The present number of members is between 400 and 500, each paying a contribution of $1 50 per annum; or $10 for life. Admittance charges to exhibitions add to our funds. We possess real estate worth about $2,000. A general Fair is held yearly, and trials of mowers, reapers, and ploughs take place occasionally. From $600 to $700 dollars are awarded as premiums annually, a portion of it in agricultural books and papers. The largest prize offered was $50, in 1853, for 160 bushels of shelled corn produced on an acre of ground within the county, but no one ever claimed it. Not more than $10 are now offered as a single prize, which is for the best and largest display of implements, and for the best portable steam-engine. Five dollars are presented for a few articles, but the most common award is $3. We publish our transactions, including the reports of committees and allotment of prizes, in the county papers, which circulate about five thousand copies.

Improvement both in domestic animals and crops has been considerable, and a general interest is manifested for higher excellence. The annual distribution of agricultural books and papers, as premiums, is regarded as the most important feature in our system. The money value of these is rarely considered so much of an object as the honor of success.

Butler County Agricultural Society, Pennsylvania.

This Society was organized June, 1855, and now contains 350 members, each paying $1 initiation fee, and an equal sum per annum; or $20 for life. Voluntary contributions increase our income. An annual Fair is held, when $450 are awarded as premiums, the largest being $10, respectively, for a full-blooded Morgan stallion reared in this county; for the best from any other division of the State; and for the best "train" of working oxen. We publish nothing but rules and regulations and the list of prizes, which appear in the county newspapers.

An impetus has been given to the improvement of domestic animals, and consequently we have better horses, horned cattle, sheep, and swine. Animals are imported for breeding purposes. As far as the surface of the ground may permit, the various implements which have stood the test of usefulness are being adopted, and a decided advantage is perceptible.

Centre County Agricultural Society, Pennsylvania.

Auxiliary to the State Agricultural Society, ours was organized January 28, 1851, and now contains 374 members. Each of these pays an initiation fee of 50 cents, and $1 per annum; or for life membership, $5. Charges for admission to the Fairs further increase our funds. Until 1857 and 1858, an annual Fair was held, but those years were considered unfavorable for the purpose. The amount paid for premiums at the last Fair was $280, of which the highest, $5 each, were offered for the best stallion, best acre of wheat, and best acre of corn.

The principal benefit arising from our Society is that the people take a more general interest in agricultural pursuits, seeking such knowledge as will assist them in making their lands productive, and improving their cattle.

Chester County Agricultural Society, Pennsylvania.

This is an old Society, but suspended operations for a number of years, reorganized in 1853, and chartered April 25, 1854. The present number of members is 646, each paying an initiation fee of $1, and an equal sum annually. We issued stock in shares of $10 each to members of the Society, (the whole amount being limited by our Constitution to $10,000,) for the purpose of raising funds to purchase ground, and to erect fixtures for our exhibitions. In real estate and buildings, we at present possess $6,500 worth. An annual Fair is held in October, and a show of horses in the spring. At our late exhibition, we awarded $1,200 in premiums, consisting of money, silver plate, and agricultural periodicals, the largest prizes being a

silver goblet, valued at $25, for the best arranged and best cultivated farm in the county, and $10, each, for the best herd of Short-horned cattle, and for the best yoke of oxen. Small amounts were occasionally spent for seeds, but since the Patent Office has conferred upon us favors of this kind none have been purchased. We publish an annual Report, in pamphlet form, of about sixty pages, and from eight hundred to a thousand copies. Our library is of recent formation, and contains only a few volumes.

Agriculture has decidedly improved since the formation of this Society. Among the premiums distributed, are from $300 to $400 worth of agricultural periodicals, which alone must aid materially in the diffusion of rural knowledge among our people, and contribute to their social and intellectual advancement.

Crawford County Agricultural Society, Pennsylvania.

Organized in 1853. Our present number of members is 322. An initiation fee of 50 cents is required of each. Our other mode of obtaining funds is by admittance charges to the Fairs, being 15 cents for each person. A Fair is held annually, at which, in 1858, $709 were paid for premiums, the largest being $10 for horses and cattle. We publish nothing but our prize list and awards.

Since the Society has been organized, our county has increased in wealth, and in the knowledge of proper farming. But the greatest improvement has been in various kinds of stock. Our cattle will compare favorably with, if not surpassing, those of the oldest county in the State; and as for numbers at our Fair, in 1857, we had 430 head of cattle, and 510 horses. At the last Fair 327 of the former, and over 450 of the latter.

Delaware County Institute of Science, Pennsylvania.

This Society was organized September 21, 1833, and chartered February 8, 1836. The present number of members is 34, each paying $2 initiation fee, and $1 a year. We own 2 acres of land, with a substantial stone building, one floor of which is used as a lecture-room. Our transactions are occasionally published in the county papers. We possess a library of four hundred volumes, mostly scientific works, valued at $500; and an extensive collection of specimens in natural history; also a nearly perfect herbarium of our county.

Since the establishment of a County Agricultural Society, at this place, but little attention has been given to the subject by our Institute, except in the distribution of seeds, cuttings, and grafts.

Erie County Agricultural Society, Pennsylvania.

This association was organized May 2, 1848. Our present number of members is 374. The payment of $1 a year constitutes member-

ship; or $10 for life. From the State, we receive $100 annually. The charge for admission to our Fairs is 15 cents. We have a lease for ten years from the city of Erie of 20 acres of ground, which, at a cost of several hundred dollars, we have inclosed with a fence. An annual Fair is held, when from $600 to $1,000 are paid for premiums. The largest ever offered was, $25 for the best combined mowing and reaping machine. Our library contains about two hundred volumes.

A marked improvement is perceptible in the agricultural productions of our county since the organization of this Society; and superior breeds of cattle, sheep, &c., have been introduced. Dwellings and other farm buildings have become more tasteful and convenient. Agricultural papers are generally taken by our farmers.

Indiana County Agricultural Society, Pennsylvania.

Organized January 3, 1855, and chartered October 1, 1857. Our Society now contains 1,800 members, each paying an initiation fee of $1, and 50 cents annually thereafter. The payment of $5 constitutes life membership. In addition to this, the Society receives $100 per annum from the county, and charges each visitor to the Fair, except members, 25 cents. The funds in our treasury amount to $400, and we possess 6 acres of land, all fenced, with buildings and accommodations for the shows, estimated to be worth $1,500. An annual Fair is held, continuing three days, when from $400 to $500 are generally paid for premiums, though in October, 1858, the amount proposed was about $950, offered for the best horses, mules, cattle, (blooded,) crude grains, manufactured articles, vegetables, &c. An account of our exhibitions is published in the newspapers of the county.

We believe that the Society has been of much benefit to the agricultural interest here, especially producing a marked improvement in all kinds of stock.

Lancaster County Agricultural and Mechanical Society, Pennsylvania.

This Society was organized August, 1857, and chartered January, 1858. The present number of members is about 500, each of whom pays $1 a year. For life membership, $10 are required; but there have been no applicants of this class. By the sale of tickets of admission to the exhibitions, we further increase our funds. A Fair is held annually, when about $800 in money and $50 in books are awarded as premiums, the largest prize offered being $50 for the fastest trotting horse or mare. The Patent Office has supplied us so bountifully with cuttings and seeds that we have had no occasion to expend money for this purpose.

There is an increasing desire for the improvement of cattle. Our

horses are excellent, having received the greater share of attention. Agricultural knowledge generally is now in higher estimation.

Lancaster City and County Horticultural Society, Pennsylvania.

The date of our organization was October, 1857. We have at present 52 members, from each of whom an initiation fee of $1 and a like sum annually are required. A payment of $10 constitutes life membership. We meet in the city of Lancaster semi-monthly during the season of early fruits, vegetables, and flowers. Exhibitions are then held, and premiums offered, after which season they are awarded monthly the remainder of the year. From $10 to $30 are thus expended per annum. Our largest prize has been $5, for grapes. In a county paper of large circulation we publish our transactions. The Rural Department of this paper is edited by the Corresponding and Recording Secretaries of this Society. Our library, recently commenced, contains twenty-one volumes.

Our Society has already attained good results by experiments with different plants, fruits, &c., the distribution and exchange of seeds, grafts, and cuttings, and the public exhibition of rural productions. Previously, the new and improved varieties of fruits and vegetables were found chiefly in the possession of a few amateurs; now they are cultivated throughout the county.

Historical, Agricultural and Mechanics' Institute, Lancaster county, Pennsylvania.

Incorporated in 1857. Our association at present contains over 400 members, each paying $1 annually; or $10 for life. Contributions are made to our funds from other sources. We have paid $200 to lecturers. Our library contains about eleven hundred volumes, valued at $2,000. We have a small museum, consisting of four hundred birds, five hundred minerals, and various other objects of natural history.

The action of this association has evidently increased a taste for reading and acquiring knowledge, which has been the end especially aimed at in its organization.

Lawrence County Agricultural and Horticultural Society, Pennsylvania.

Organized November 17, 1851. Our Society contains at present 240 members, each paying $1 initiation fee, and an equal sum annually. We draw $100 yearly from the county, and receive admission charges from all who are not members. Our treasury contains $308. We possess no real estate, but rent 10 acres of land, which is inclosed. An appropriate building has been erected, with such other ac-

commodations as we require for exhibitions. An annual Fair is held, at the last of which we paid $710 for premiums, the largest, $10, being for the best 5 acres of wheat. Our proceedings are published in the three papers of the county.

The agricultural interests of our county have been promoted, through this Society, by the improvement of various kinds of stock, and of the different crops, &c. Some of the seeds obtained from the Patent Office have proved valuable.

McKean County Agricultural Society, Pennsylvania.

Organized June 17, 1852. The present number of members is about 80, each paying an initiation fee of $1, and an equal payment annually; or, for life membership, $10. The county is authorized to pay our Society an amount equal to that collected by the members, not to exceed $100. An annual Fair is held, when about $200 are expended for premiums, from $5 to $8 being the largest. Most of our lectures have been free. We possess a trial ground. Our transactions are published annually in the county papers.

We have been obliged to struggle with many difficulties, as, at first, but little attention was paid to the science of agriculture, and our farmers did not abandon this indifference until within the last few years. They now take many more papers relating to their pursuit, discuss the most important subjects, and make experiments, thereby increasing their crops. Blooded stock, of various kinds, are improving; and thus a new interest is added to our Fairs.

Shenango Farmers' Club, Mercer county, Pennsylvania.

This Society was organized in 1855, and at present contains 40 members, each paying 50 cents at initiation. Other funds are obtained by assessment and fines. Our library consists of fifty volumes, besides agricultural periodicals.

Semi-annual meetings are held, when each member communicates his experience in the improvement of animals and the increase of crops. Both of these divisions have been benefitted.

Mifflin County Agricultural Society, Pennsylvania.

This Society was organized in 1851. The number of regular members who conduct affairs at present is about 100. Regular and irregular, from 300 to 400. A fee of $1 per annum is paid; or $10 for life. We are entitled to $100 a year from the county, when an equal sum is raised by membership. An annual Fair is held, when, after deducting expenses, the entire receipts are disbursed in premiums, the largest of which is $10. for live stock.

Since the establishment of this Society, there has been a marked improvement in horses and cattle, a number of blooded animals having been purchased by farmers and others, at high prices. Improved machinery has also been more generally diffused; and in other respects more attention paid to experimenting in crops.

Montgomery County Agricultural Society, Pennsylvania.

This Society was organized about twelve years ago; and now contains 250 members, each paying $1 initiation fee, and 50 cents per annum; or $10 for life. We receive annually $100 from the county, and charge 15 cents for each admission to the Fair. The grounds we at present occupy are held by us under lease for twelve years, three of which have not yet expired. Two Fairs are held per annum: one in June, for the exhibition of breeding stock, and trial of agricultural implements; the other in October, for the general display of stock, tools, produce, and mannfactured articles. The amount last awarded as premiums was $1,125, the largest being $20 for the best cultivated farm of 100 acres; an equal sum for the best arranged farm buildings; and $10 for the best imported cattle or sheep. We pay only the travelling expenses of lecturers. A Report of our transactions is made annually to the State Society, and embodied and published in its volume. We have not yet obtained a library, but are endeavoring to do so, by purchasing a share in the "Norristown Collection," devoting our annual appropriation to this purpose.

In every department of our agriculture improvement has been manifest. The use of new machinery has led to a thorough cultivation of the soil; while the economical production of manure, and its application to the greatest extent: the dissemination of agricultural reading; and the introduction of superior live stock are effecting important improvements throughout the district.

Farmers' and Mechanics' Institute of Northampton County, Pennsylvania.

This Institute was organized October 24, 1855, chartered April 21, 1856, and at present has 263 members. It is a joint-stock association. The number of shares is 1,000, and the par value of each $25. Its capital is $25,000. Our other modes of obtaining funds are by the receipts from the exhibitions, and the sale of season and other tickets. We own 30 acres of land, eligibly located in the vicinity of the Borough of Easton, with a hall 60 feet wide by 150 feet long, two stories high, overlooking the grounds and the surrounding country. It is admirably adapted for exhibition purposes. Here two Fairs are held a year—the floral and the annual. The amount of premiums offered at the last-named has been from $1,400 to $1,600, of which from $1,000 to $1,200 were paid. At our floral Fairs we have given several hundred dollars. The largest sum ever offered by us as a prize for any one object was

$200, for a collection of imported stock, cattle, sheep, &c., and some cross breeds. We have had a course of six lectures, for which we paid $200. Several gentlemen, however, lectured for us without charge, and we have instructive addresses at our Fairs. A part of our 30 acres was used last year as an experimental farm. We have as yet only published the addresses delivered at our Fairs.

The benefits resulting from our organization have been important and general, especially as regards cattle and grain.

Perry County Agricultural Society, Pennsylvania.

This Society was organized March 8, 1852, and chartered on the 5th of April following. It has at present 500 members. The initiation fee is $1, and the amount required for life membership $10. We hold an annual Fair, at which $400 are paid for premiums; the largest has been $8, for the best team. These Fairs have promoted the diffusion of agricultural knowledge, and directed particular attention to the rearing of domestic animals.

Philadelphia Society for Promoting Agriculture, Philadelphia county, Pennsylvania.

This Society was organized February 11, 1785, and chartered February 14, 1809. The present number of members is about 300, each paying $3 a year; or $20 for life. We have $800 at interest. Formerly we held annual Fairs; now they are occasional. The objects of our premiums have been chiefly improved cattle, horses, sheep, and crops. From time to time, a volume is published, or a pamphlet. Our library contains about four hundred volumes, valued at from $500 to $600.

The principal good we do is by discussions on agricultural subjects; by providing for our members a library and room for conversation; and by having an occasional exhibition, or publishing in pamphlet form a papor on rural affairs.

Schuylkill County Agricultural, Horticultural and Mechanical Association, Pennsylvania.

This Association was organized July 26, 1856, under the general law. The present number of members is 350, each paying $1 yearly; or $10 for life. We own an inclosed ground, with buildings, where we hold an annual Fair, when from $300 to $400 are awarded as premiums, the largest being $15 for the best trotting horse.

The benefits resulting from this organization are evinced in the increased crops as well as the improved animals. Agricultural books and papers are doing good work.

Somerset County Agricultural Society, Pennsylvania.

This Society was organized April, 1851, and now contains about 300 members. The amount of initiation fee is $1, and an equal sum is paid annually; or $5 for life. Our other mode of obtaining funds is by charges for admission to the shows. A Fair is held yearly on our own grounds, when about $450 are awarded for premiums, the largest being $15 for the best horse, and $10 for the best bull. We publish a financial Report yearly.

At our various meetings, in the course of the year, experiments are reported, and questions discussed; while agricultural journals are distributed as prizes. Our prospect, notwithstanding many discouragements, is brightening. Imported bulls and Morgan horses have been recently brought into the county.

Sullivan County Agricultural Society, Pennsylvania.

This Society was organized June, 1852, and chartered in 1851. The present number of members is about 100, each paying 50 cents initiation fee, and an equal sum yearly. We receive annually from the State Society an amount corresponding to that collected by ourselves, or, otherwise, $100. A Fair is held once a year, when $125 are awarded as premiums, the largest being $5 for ploughing. Addresses are delivered gratuitously, and other instruction is obtained by private contributions. Our transactions, including lectures, are published in the county paper, and also, in part, in the annual Reports of the State Society. From $10 to $50 per annum are appropriated for agricultural books and periodicals, which are distributed as prizes.

The best farmers assemble at our Fairs and business meetings, and learn from each other the various modes of tilling the soil, improving stock, and the utility of newly invented implements. Our distribution of books, including seventy volumes of the Patent Office Reports, has produced good results. Great improvements may be seen in domestic animals, and many of the farmers have Durham and Devon cattle and Southdown sheep, while others are trying (by attention to common breeds) to convince us that the domestic stock is as desirable as the imported. There is but little increase in field crops, although much in culinary vegetables.

Tioga County Agricultural Society, Pennsylvania.

This Society was organized September 12, 1854, and at present contains 450 members, each paying $1 initiation fee, and an equal sum yearly; or $10 for life. We receive annually from the county $100 or less, according to the contributions of members; and the gate fees to exhibitions further increase our funds. Cash on hand amounts to about $120. A Fair is held yearly, when from $450 to $500 are

awarded as premiums, the largest being $15 for the best cultivated farm and implements combined. For lectures we have paid from $15 to $50 per annum. Our transactions are reported to the State Society, by which they are published.

An interest has been excited in the raising of roots and fruits, and the improvement of horses and cattle. The ladies are also eager to display the best of their handiwork in the Floral Hall. Our Fairs are regarded as holidays most profitably spent.

Washington County Agricultural Society, Pennsylvania.

The first organization of this Society took place in 1836. It was reorganized in 1847, and chartered August 11, 1855. We have 100 life members, paying an initiation fee of $20 each, while the payment for a single yearly membership is $1. Receipts during the Fairs and rent of grounds furnish us with another source of income. We possess, at present, in money, $1,250, and real estate to the value of $3,000. A Fair is held annually, at which premiums are offered amounting to from $700 to $800. The largest have been $25 and $20, for mowing and reaping machines. We have a blooded stallion, for purposes of breeding.

Among the benefits resulting from our Society may be mentioned the improvement in the general appearance of farms throughout the county; as well as that of stock, horses in particular, which latter will now compare favorably with any in the Union.

Monongahela Valley Agricultural and Horticultural Society, Washington county, Pennsylvania.

This Society was organized in April, 1853, and chartered in May, 1855. It has now nearly 400 members, paying $1 each annually, which entitles the whole family to free admission at the Fairs. Originally, we gave certificates of eight years' membership for $5, but discontinued this system after the first year. In 1854, we received a donation of $100 from the county. Admission charges at the Fairs (25 cents each person) furnish another mode of increasing our funds. Our treasury contains $240. The Society has leased and inclosed 5 acres of land, on which sheds, stalls, and tents have been constructed, costing $550. An annual Fair is held, when about $400 are paid for premiums—the largest, $25, for the best herd of blooded cattle. The lectures delivered before us are gratuitous, though we have awarded prizes for essays, &c. We publish in newspapers and pamphlets a premium list and the reports of judges on articles exhibited. Our library is but small, being composed of Patent Office Reports, the proceedings of various State Agricultural and Horticultural Societies, periodicals, &c.

There is no doubt that our Society has been the means of diffusing much benefit by stimulating greater exertions, and producing a rivalry in almost every department of agriculture, particularly as to stock. As an evidence of this, at our Fair in October last, there were 158 horses, 72 cattle, and 84 sheep entered for premiums. Fruit, also, has much improved. We desire to add that our members highly prize the Reports of the Patent Office, from which they derive information not otherwise attainable.

Florence Mutual Agricultural Association, Washington county, Pennsylvania.

This Society was organized March 12, 1858. The present number of members is 600, each paying an initiation fee of $1, and an equal sum yearly; or $10 for life. An annual Fair is held. Three hundred and fifty dollars have been awarded as premiums, the largest being $10 for light and heavy draught horses. We possess a lease of 4½ acres of land, on which is a course for the exhibition of horses. Suitable buildings have been erected, and the entire place is inclosed.

Rhode Island Society for the Encouragement of Domestic Industry.

This Society was organized February 24, 1820, and its charter granted in October of the same year. We have 818 members, all for life, each of whom has paid $5, being the amount required for such membership. Our property at present consists of bank stock, par value, $16,150; mortgage, $1,000; fixtures and movables, $1,969.

We held a Fair in 1855, and one in 1858. Before 1855, with some exceptions, one was held annually. Hereafter. as often as the public may require, or we can afford it, there will be such an exhibition. This year, we have appropriated $2,450 for premiums and gratuities. The Fair in 1855 included a horse show as its main object. Individuals guarantied the Society against loss. The largest premiums then offered were for stallions, $200. At all other Fairs, the Society has paid its premiums out of its own funds, and has neither asked nor received any guaranty against loss. Premiums are generally offered for stock, for agricultural experiments, for horticultural products, for manufactures, for products of mechanical labor, and for every branch of domestic industry. We offer awards for successful experiments in agriculture; and as to chemistry, we have an arrangement with Brown University by which an analysis of soils may be obtained at a reasonable expense. Our Transactions are published annually, generally a thousand copies of from one hundred to one hundred and twenty-five pages. Only about one hundred and twenty-five volumes are contained in our library, which was recently commenced. Its value has never been estimated by the Society, nor does it form a part of our reported fixtures and movables. We have a small

museum. Among other things, it contains one of the first three spinning frames built by Samuel Slater, for spinning cotton by power; one of the first carding machines built by William Slater; a plough and threshing machine from Egypt; old linen and woollen wheels, &c. Though, as a Society, possessing no domestic animals for the purposes of breeding, yet stock of this class can compete for our high premiums only when kept for service in the State for a limited period. This Society holds but one meeting in the year. Its business is performed by a standing committee of 36 members, who assemble once at least in every two months. The committee is divided into six sub-committees—one on Agriculture, one on Horticulture, one on Manufactures, one on the Mechanic Arts, one on the Fine Arts, and one on Miscellaneous Subjects. These are required to notice everything new or valuable in their several departments within their knowledge, and to report to the standing committee.

The rooms of the Society are open all business hours, and supplied with many standard works on agriculture and the arts, together with several valuable periodicals.

Aquidneck Agricultural Society, Newport county, Rhode Island.

The date of our organization was November 22, 1851, and of the charter November 18, 1854. Our present number of members is 125, each of whom pays an initiation fee of $3. By the sale of tickets of admission to our Fairs, we obtain further funds. We possess 10 acres of land, inclosed with a board fence 8 feet high. Here we have a hall, valued at about $5,000. An annual Fair is held, when $400 are paid for premiums, the largest, $30, being for the best mowing machine, as tested at a trial. Our lectures have generally been gratuitous, though we have expended $30 for an address.

An interest has been awakened in our community as to the improvement of farm stock. The offer of premiums has brought to our knowledge a crop of corn which yielded over 110 bushels, shelled, to the acre. Our weekly meetings are well rewarded by the new ideas gained, or facts confirmed; still, we find ourselves divided on many important points as to farm management. But we look forward, trustfully, to the day when science, walking hand in hand with experience, shall dissipate this contest of doubts, and the operations of the farmer shall be as certain as those of the mathematician.

State Agricultural Society of South Carolina.

This Society was organized August 9, 1855, and chartered December, the same year. It has now 605 life members. A member for the year pays $2—for life $25. The State appropriates for our benefit

$5,000 annually. In real estate, we possess grounds and buildings, well arranged for purposes of exhibition, and worth about $20,000 or $25,000. An annual Fair is held, when from $4,000 to $5,000 are paid for premiums, the largest being $30, for essays on Meteorology, the restoration of wornout lands, plantation hygieine, diseases of domestic animals, fish-culture, largest yield of field crops, cotton, corn, and wheat, essays on pomology adapted to the South, best managed plantations, &c. The Society, in its first year, published a monthly Journal, embracing agricultural matters as well as transactions, but this undertaking was abandoned on account of the expense. We are now about to issue a volume of annual Transactions. Our library is composed of volumes of the "Agriculturist" (the Society's organ) and of exchange works.

The increased interest taken in our Fairs affords a most satisfactory proof of benefits resulting from the Society. A large number of farmers and planters from remote parts of the State attended our last exhibition, and a general opinion seemed to exist that our efforts were destined to effect important reforms in the agricultural interests of the State. A new impetus has been given to the restoration of wornout lands, manuring, improved implements adapted to our work and to the negro, superior breeds of domestic animals, importation of new varieties of animals and seeds, and an increase in the yield of crops. Our farmers have demonstrated that as high as 200 bushels of corn, 3,500 pounds of seed cotton, 50 bushels of wheat, 344 bushels of sweet potatoes, and 6,000 pounds of hay, respectively, can be grown by judicious management upon an acre of ground. These facts have aroused a new zeal, and increased largely the number of competitors. The improvement in orchards and nurseries and in the mechanic arts has not been less conspicuous.

Fairfield Agricultural and Mechanical Association, Fairfield district, South Carolina.

Our Association, which has for its special objects Pomology and Horticulture, was organized July 2, 1855, and at present numbers 233 members. The annual payment is $2, and the amount for life membership $15, or the interest thereon, payable each year. Our other modes of obtaining funds are from the entrance fees, $2 being required of each exhibitor who is not a member, and from the charge of admission to the ground and hall, being 50 cents for one not a member. We hold an annual Fair in October. In 1858, we paid for premiums $239. The largest we have ever offered were—$10, for an essay on corn; $10, for an essay on cotton culture; and $15, for the best and largest variety of fruits at the *ad interim* summer exhibition. Our prize essays are published in "The Farmer and Planter."

Some of the benefits resulting from our Association are—a knowl

edge of the best varieties of seeds, fruits, and stock; the planting of numerous orchards of fruit trees and vineyards, though the latter are yet too young to give any fair indication of what may be achieved by our district, but even now many gallons of good wine are made annually; a great improvement in the milch cattle, and swine; a great increase in the yield of wheat; an increase in the yield of cotton, owing to the introduction of better seed, and of guano and mineral manures; and an improvement in the quality of corn. These benefits we attribute in the main to our Association, but the United States Patent Office, by the distribution of its Reports, seeds, and cuttings, has contributed toward these results.

Union District Agricultural Society, South Carolina.

This Society was organized August, 1856, and at present contains about 110 members, each paying $1 per annum, which sum also entitles to exhibit all articles free of charge. A yearly Fair is held, when $150 are awarded as premiums, the largest being $10, for the finest horses, cows, &c. Reports of our transactions are published annually in the agricultural and other papers of the county.

The benefits resulting from this organization are evident. We have collected many important facts in relation to seasons, crops, &c. New and improved breeds of animals have been introduced, and superior implements, seeds, fruits, and trees. A Pomological and Horticultural Society has sprung from this association; and no part of the country can now boast of better varieties of fruits, many of which are native seedlings. The books and seeds received from the Patent Office are eagerly sought after, and in numerous instances have proved valuable.

Tennessee State Agricultural Bureau.

This Bureau was organized April 20, 1854, and chartered February 19, the same year. It is composed of the Governor of the State, *ex officio*, a member from each of the three grand divisions, and five from Davidson county, appointed by the Governor, with one from each of the County Societies chartered by the Bureau, elected by such Society. There are now thirty-two County Societies. The State contributes $500 a year to the Bureau, and the necessary expenses of the members in attending its meetings. It also pays each County Society $200 yearly, and each of the three-division Fairs $1,000 annually. The other modes of obtaining funds are by gate and entrance fees at the exhibitions. The Fair grounds of this Bureau at Nashville and improvements are worth $50,000; those of the division Fairs at Knoxville and Jackson, $20,000 each. A State Fair is held once a year, when about $3,000 are paid for premiums, the largest being $100 each for the best 10 acres of corn, wheat, and cotton.

Prizes are offered for agricultural experiments. Our Transactions are published biennially by the Legislature, two volumes having been issued, ten thousand copies of each containing from five to six hundred pages.

The benefits resulting from this organization have been great.

Bedford County Agricultural and Mechanical Society, Tennessee.

This Society was organized March, 1857, and chartered in May, the same year. As the members are only annual, their number cannot be precisely stated. Each pays $2 at initiation, and an equal sum per annum. The State appropriates for our use $200 a year, and voluntary contributions further increase our funds. We have $600 on hand. An annual Fair is held, when from $800 to $1,000 are awardod as premiums, the largest being $25 for the best cultivated farm. Our transactions are published by the State Bureau.

All the objects for which this Society was organized have been attained in a great degree, and the future is full of promise.

Fayette County Agricultural and Mechanical Society, Tennessee.

This Society was organized July 4, 1854, and chartered January, 1855. The present number of members is about 350, each paying $2. which entitles to life membership. We are allowed $200 per annum from the State, and have besides a capital of $300. When deemed necessary, other amounts are readily obtained by subscription. We possess 6 acres of land, upon which an amphitheatre, a Foral Hall, stalls, and other appropriate buildings are erected, all substantially inclosed, and worth about $2,500. An annual Fair is held, when from $500 to $800 are awarded as premiums, the largest being $20 for the best bale of cotton weighing 400 pounds. Members are appointed to deliver lectures, and also, at each monthly meeting, two or three are chosen to write essays. This system has been in operation three years, with important results. Yearly Reports of our transactions are made to the State Bureau, by which they are published.

Giles County Agricultural and Mechanical Society, Tennessee.

Organized July 4, 1855, and chartered May 5, 1856. Our Society at present contains about 300 members, each paying an initiation fee of $2, and $1 per annum; or $15 for life membership. By the sale of family tickets, gate fees for admission, and charges for entrance on articles exhibited, we obtain additional funds. We have a capital paid in of $300, and the State appropriates $200 annually for our

benefit. A Fair is held every year, usually in the fall. At the last, $820 were distributed as premiums, the largest being $15 for the finest and best blooded mare and stallion. We have offered $10 for an agricultural essay. The State Bureau and our village newspaper are furnished with Reports of our transactions, which are thus published and extensively circulated. We do not own, but lease, a Fair ground.

A better agricultural and mechanical spirit has been diffused by our annual exhibitions; and a taste for superior farm products, with more enlarged and liberal views generally, have resulted. Improvement in domestic animals, induced by purchases of the best breeds, is apparent. In seeds, also, particularly in wheat, and the flour manufactured therefrom, our advancement is remarkable. The social intercourse of citizens for conversation on subjects of agricultural interest has been found by us to produce good effects.

Haywood County Agricultural and Mechanical Society, Tennessee.

This Society was organized August 7, 1854, and chartered September 22, the same year. The present number of members is 200, each paying $1 initiation fee, and an equal sum yearly; or $10 for life. Other funds are obtained by subscription. We possess land and improvements valued at $1,500. An annual Fair is held, when from $400 to $500 are awarded as premiums, the largest being $20 for the best bale of cotton. Addresses are sometimes printed at our expense, while our transactions are published by the Agricultural Bureau at Nashville.

Benefits resulting from the Society are perceptible in the increased interest taken by farmers to preserve their lands, and reclaim those which are worn out; also, in the number and improvement of fine horses, &c.

McNairy County Agricultural and Mechanical Society, Tennessee.

This Society was organized August, 1856, and chartered June, the same year. The present number of members is 156, each paying $5. We receive from the State $200 per annum, and possess a permanent fund of $300, the interest of which is paid annually. All articles exhibited by persons not members are taxed one-third the premium sought for. Gate fees further increase our income. We own 7 acres of land, well fenced, and improved with houses, amphitheatre, and stands. A Fair is held each year, when about $200 are awarded as premiums, the largest being $10 for the best bale of cotton, the best three bales, best five bales, and best sample. We publish our transactions only in the county newspapers, but procure enough extra copies of these to supply the people and the members.

A spirit of improvement has been awakened, which is marked in almost every common product of the earth and in the domestic

animals. Some of our farmers, by extraordinary efforts, have produced from 600 to 700 pounds of cotton per acre, and, in certain cases, 1,000 and even 1,200 pounds. Corn, potatoes, beans, peas, and the grasses have also had their proper share of attention, and have increased in the same ratio.

Maury County Agricultural and Mechanical Society, Tennessee.

Organized June 4, 1855, and chartered September 10, the same year. This Society now has 96 members, each paying $2 annually. We obtain other funds from the yearly State appropriation of $200, and gate and entrance fees. Our present possessions are about $3,000 worth of improvements, such as buildings, amphitheatre, &c., upon a twenty-acre lot leased for the term of eight years. Here we hold an annual Fair, when from $120 to $1,500 are paid for premiums, the largest being $25. We publish semi-annually a volume of our Transactions, embracing five hundred pages, and of this we distribute about two thousand copies.

A great interest has been created among the farmers. More attention than formerly is given to systematic tillage, better buildings have been erected, and stock has improved.

Elm Dale Agricultural Society, Weakley county, Tennessee.

This Society was organized May, 1856. All persons who meet with us are regarded as members, and no fee is required, funds being obtained by contributions from persons who may be able and disposed. We possess a farm of 30 acres, with such implements, stock, &c., as are necessary to cultivate it on scientific principles. A general meeting is held monthly, to examine the farm, and give directions to the agent or farmer. On such an occasion, the day is spent in the discussion of agriculture and its concomitants. Every one is at liberty to propose subjects and to engage in the debate.

Our object is to conduct a small farm on the most approved plan, to try experiments, to improve seed, to procure the kinds best adapted to this county; and, by freely admitting as members all persons, to interest the whole community, that the benefits of good farming may be seen, and that all may receive the advantage of the monthly conversations. The Society is maintained by a few men who have the wish to see it flourishing, and the means to gratify their wish. There are now 5 acres of Tuscany wheat growing on the premises, the seed of which was produced here from the amount received from the Patent Office. We regard it as far superior to any wheat previously introduced into this county.

Belleville Agricultural Society, Austin county, Texas.

This Society was organized January 1, 1858. The present number of members is 25, each paying $2 annually. For lectures, $10 have been paid. We have an experimental ground of an acre. About $10 have been expended for cuttings and seeds for distribution.

A livelier interest has been created to improve in agriculture. The seeds received from the Patent Office have proved highly beneficial in increasing our crops.

Champlain Valley Agricultural Society, Addison county, Vermont.

The date of our organization was in the spring of 1857. At present, we have 700 members. A payment of $1 each is required. Charges are made for admission to the grounds, and for seats, by which our funds are increased. A beautiful lot of 25 acres has been leased for ten years. It is inclosed by a high fence, and contains a Mechanics' and Floral Hall, with seats to accommodate 1,200 persons; also a good race course, half a mile in circuit. We hold an annual Fair, when $600 are paid for premiums, the largest offered being $15 for the best loaf of bread; $5 for the best stallion; and a similar sum, each, for the best breeding mare, and the best Merino ram and ewe. From $50 to $75 are paid at the Fair for an address. A Report of the meetings and exhibitions is published in the newspaper at Vergennes.

It is impossible to estimate the results of a Society so lately established as ours, but, from the interest manifested, we have reason to anticipate great improvements.

Orange County Agricultural Society, Vermont.

This Society was organized in January, 1846, and chartered in October, 1845. Its present number of members is 400. An initiation fee of 50 cents each is required. Appropriations from the State are also received. Our Fair is annual, when $300 are paid for premiums, $10 being the largest, awarded for field crops, or orcharding, &c. We expend yearly for lectures $25. A trotting course, half a mile long, is the property of our Society.

The benefits resulting from our organization have been important. Documents and various kinds of seeds, received from the Patent Office, distributed as far as we were able, have advanced the farming interests. Many of these seeds are valuable. Approved cultivation, the nature of the soil, and the best mode of fertilizing are becoming more generally regarded. Care is now taken to obtain superior breeds of domestic animals. The horse receives particular attention;

and for speed and endurance. we think that our Black Hawk and Morgan breeds cannot be excelled by any in the country.

Windsor County Agricultural Society, Vermont.

In accordance with an act of the General Assembly, which took effect November 1, 1843, this Society was organized April 7, 1846. At present, we have 456 members, each paying $1 annually. For life membership, $10 are required. The State appropriates $2,000, to be divided among the counties according to the population, making the share we receive $244. We also have an inclosure, and the proceeds from entrance fees, at 10 cents, give us about $350 at each of our annual Fairs, at which an address is delivered, costing about $25. We are preparing to publish a volume of Transactions.

From the circumstance that our domestic animals are better fed and housed in winter, more wool grows on our sheep, and more flesh on our cattle, now than formerly. This improvement in a great degree is believed to be the result of our Fairs and annual meetings, when we assemble to hear carefully prepared reports on the various kinds of stock. Our agricultural implements and tools are also much improved.

Union Agricultural Society of Virginia and North Carolina, Dinwiddie county, Virginia.

Organized in 1853, and chartered in March, 1854. Our Society contains about 1,000 members, each paying $2 initiation fee, and $1 a year; or $20 for life membership. The Common Council of Petersburg appropriates $2,000, per annum, and the citizens contribute about the same sum yearly, for our benefit. We possess a model and experimental farm near the city, containing 100 acres, the value of which is $20,000. An annual Fair is held, when $3,500 are expended for premiums, which are awarded for stock, household manufactures, essays, &c. We have a library of about one hundred and fifty volumes, containing some of the best works on agriculture.

The general benefit resulting from the institution of our Society is thought to be considerable.

Abingdon Hole-and-Corner Club, Gloucester county, Virginia.

This Society was organized January, 1854, and at present contains 12 members. Regular meetings are held monthly, on the farm of each member, in rotation. Some agricultural question is then discussed, essays are submitted, experiments reported, the farm inspected, and operations criticized. The number of members is limited to twelve.

Much benefit has resulted in the diffusion of knowledge, crops have at least doubled, and domestic animals have greatly improved.

Jefferson County Agricultural and Mechanical Society, Virginia.

This Society was first organized in 1850, under the name of the "Valley Agricultural Society;" but in 1856, it was changed to the present name, and so chartered, to distinguish it from the "Valley Agricultural Society" of Frederick. The number of members is now 164, each paying an initiation fee of $3, and $2 annually; or $20 for life. Another mode of obtaining funds is by charges at the Fair gates. We lease our grounds, and hold an exhibition yearly, when from $500 to $1,000 are awarded as premiums, the largest being $50 for the best reaper and drill. Some of the seeds from the Patent Office have proved valuable.

A marked improvement has taken place in our mode of farming, and much attention is given to fruit-growing. We have the South-down, Cotswold and Merino sheep, which were directly imported by us; also, thorough-bred Durhams, Devons, Alderneys, and Ayrshires, and the "Kaisi, or Damascus" cattle, celebrated as oxen, and for great milking qualities. The latter were brought from Syria by Lieutenant Lynch, of the navy, and presented to the State. The oxen grow to a large size, are quick as horses in their gait, and can undergo heavy labor in the hottest weather, without distress.

Valley Agricultural Society, Jefferson county, Virginia.

Our Society was organized April 25, 1856, and chartered March 3, 1858. It has 802 members. An initiation fee of $3 is paid by each, and $2 annually. The amount required for life membership is $10. By gate charges, rents, &c., our funds are further increased. We have a perpetual lease on our Fair grounds, the improvements on which belong to the Society. An annual Fair is held, when about $3,000 are paid for premiums, the largest having been $20 for the best 10 acres of wheat, and a similar sum, each, for the best 10 acres of corn, and clover seed; also for stallions and bulls.

Our Society has not existed sufficiently long to have accomplished much. It is considered, however, that great benefits will result to this portion of the valley from the improved and still improving condition of the stock of the neighborhood, arising from sales made of prize animals at our Fairs. A number of these, especially some from Kentucky and elsewhere, have been kept among us. In like manner, improved implements, &c., have been introduced into our valley.

Southwestern Virginia Agricultural Society, Wythe county, Virginia.

This Society was chartered October 13, 1857. Its present number of members is 300, each paying an initiation fee of $2. The amount

required for life membership is $20 each. A Fair is held annually, when $200 are paid for premiums, the largest being $20 for the best stallion.

Under our present organization, we have only given two exhibitions. The result has been that all our principal farmers in the southwestern part of the State are breeding and rearing the best stock anywhere to be found in Virginia. Improvement in crops, also, surpasses expectation.

Badax County Agricultural Society, Wisconsin.

Organized and chartered April 11, 1857. Our Society has now 70 members, each paying $1 initiation fee, and an equal sum per annum. The payment of $10 constitutes life membership. Our other modes of obtaining funds are from the admission fees to the Fair grounds. We possess, in real estate, 10 acres of land, inclosed with a board fence 7 feet high, and valued at $800. Here an exhibition is held annually, when $100 are paid for premiums, the largest being $5 for the best address, a similar sum, each, for the best stallion, and best acre of wheat, and $4 for the best bull. Our library consists of forty-seven volumes, worth $100.

Since the Fair of 1857, there has been a great improvement in domestic animals and an increase in crops. The desire for agricultural knowledge has become general.

Crawford County Agricultural Society, Wisconsin.

This Society was organized February 24, 1858, under a general law. The present number of members is about 100, each paying an initiation fee of $1, and an equal sum yearly; or $10 for life. We receive from the State $100, annually, and entrance charges to Fair grounds. A Fair has been held, when $50 were awarded as premiums, the largest being $3 for horses and cattle. Exhibitions are to take place annually. Our transactions have been published by the State Society.

From present indications, we confidently anticipate a career of usefulness.

Dane County Agricultural Society, Wisconsin.

This Society was organized April 5, 1856, under a general law. The present number of members is about 200, each paying $1 annually; or $10 for life. The State appropriates for our use $100 per annum, and subscriptions further increase our income. We have about $200 on hand. An annual Fair is held, when $550 are awarded as pre-

miums, the largest being $25 for agricultural and horticultural essays. For animals and articles, the prizes range from $1 to $10, a large portion of which we aim to pay in agricultural books, chosen by the farmers themselves.

Fond du Lac County Agricultural Society, Wisconsin.

This Society was organized July 17, 1852. Its present number of members is 166. The initiation fee is $1, with an equal sum, each, per annum. Life membership $10. We obtain annually from $75 to $125 by subscriptions and donations from the citizens. A Fair is held every year. At the last, $233 were paid for premiums, and also a number of Transactions of the State Society, as well as diplomas, and agricultural publications. The largest prizes have been—$5, each, for the greatest number of kinds and best variety of fruits—farm products, and best half acre of potatoes. Horses and thorough-bred cattle take the next premium, $4. We publish an account of our transactions in the county papers, each report occupying about six columns.

Benefit is derived from the intercourse of farmers. A new era has dawned for us. The State contributes for our aid $100. A large number of the Transactions of the State Society, and copies of other agricultural publications, have been distributed. Many of our farmers have imported cattle, horses, sheep and swine.

Green County Agricultural Society and Mechanics' Institute, Wisconsin.

First organized in the summer of 1853, and reorganized in July, 1857. We now have 320 members, 90 of whom are for life. The former class pay an initiation fee of $1 each, and an equal sum annually; the latter a single payment of $10. By the sale of admission tickets to the Fair and $100 per annum from the State, our income is further increased. We possess 7⅝ acres of ground, fenced, &c., worth $1,000, on which, yearly, a Fair is held, when from $300 to $400 are expended for premiums, the largest being from $10 to $25 for farms, orchards, blooded horses, and cattle.

There is a marked improvement in the stock of the county, particularly in cattle and sheep, since the organization of our Society; and much good has been done by introducing new varieties of Cereals.

Richland County Agricultural Society, Wisconsin.

This Society was organized May 13, 1857. The present number of members is 130, each paying an initiation fee of $1, and an equal sum yearly; or $10 for life. We receive $100 per annum from the State. An annual Fair is held, when $250 are awarded as premiums, the largest being $5 for the best farm crops.

Rock County Agricultural Society and Mechanics' Institute, Wisconsin.

This association was organized January 6, 1851, and chartered February 21, 1854. It contains 300 life and probably 1,000, or more, annual members. For the first, a fee of $10 each is required, and for the last $1 yearly. Voluntary contributions supply us with other funds. We own 20 acres of land, inclosed and have permanent buildings, where our Fairs are held annually, when from $1,000 to $1,500 are paid for premiums, the largest offered being $25 for the best stallion. We have published a history of Rock County, embracing our Transactions, in a volume of about three hundred and fifty pages.

Competition has been excited, and consequently our farmers till their soil better, procure superior seeds, take care of their crops, and read and think to more advantage. Improved stock has been procured, and the principles of breeding are carefully studied. Mechanical and farming implements are rendered more suitable to their purposes. But as important, perhaps, as all these, is the fact that our farming population are brought together annually, and learn something of each other.

Northwestern Union Agricultural Society, St. Croix county, Wisconsin.

This Society was organized April 14, 1856. The present number of members is 175, each paying an initiation fee of $1, and $1 75 yearly; or $20 for life. The State appropriates to our use $100 per annum, and we obtain further funds from charges at the gate. A Fair is held annually, when about $280 are awarded as premiums, the largest being $5 for horses and field crops. We have a nursery.

By means of the Society, we have been enabled to compete with the rest of the State in wheat, rye, turnips, and other products. Agricultural works have been distributed, and a general interest has arisen as to all rural affairs.

Sauk County Agricultural Society, Wisconsin.

This Society was organized June 9, 1854. Its present number of members is 154, each paying an initiation fee of $1, and an equal sum annually. The amount required for life membership is $10. Our other modes of obtaining funds are—$100 per annum from the State, private donations, town subscription, and the sale of admission tickets. We hold a Fair once a year, when about $245 are awarded in premiums, the largest being $20 for the best and fastest trotting stallion owned and kept in the county.

The principal benefits resulting from our Society have been the introduction of a better grade of horses, cattle, sheep, and swine, better varieties of farm products, and a more correct knowledge of the different soils and their adaptation to the production of grains

and vegetables. The planting of hardy kinds of fruit trees has also been encouraged. Among the seeds from the Patent Office, some have been found superior to any, from whatever source, ever used in the county.

Waukesha County Agricultural Society, Wisconsin.

Organized January 10, 1854, and chartered March 31, 1856. Our Society has now 75 life members, each paying $10. We also obtain annually from the State Treasury $100; from the sale of gate tickets $300; and $1 from each exhibitor, of which class there are about 50. Our cash now on hand is $2,500. A Fair is held yearly, when from $400 to $500 are paid for premiums, of which the largest offered has been $10. The diploma is considered a higher prize than money. We publish in our county newspapers the reports of our judges, the prize list, and the awards. There are about fifty volumes in our library.

The benefits resulting from this Society are various; but the improvement of domestic animals, crops, and mechanics' work is remarkable.

CONSIDERATIONS ON THE CAUSES AND EFFECTS OF THE DIMINUTION OF AMERICAN CROPS.

BY GUSTAVUS DE NEVEU, OF FOND DU LAC, WISCONSIN.

Notwithstanding the natural fertility of a large portion of the surface of the United States, a fertility which is acknowledged to be superior to that of any country in Europe or Asia, the average acreable product of the soil is much below that of some countries in those regions. China, for instance, which supports a population estimated at 300,000,000, or ten times that of the .United States, upon a *cultivated* surface probably not three times greater than that of this country, must produce about three times as much to the acre.

France, with an area less than one-fourth that of the settled portion of our territory, has a larger population, proving that its soil produces much more than ours.

England and Scotland, the soils of which are far from being naturally of a first order of fertility, must raise enormous amounts of life-sustaining products, as is exemplified by their large population.

The same might be said of Belgium and of several other countries.

It seems to me that few questions could be more interesting to consider than to investigate the causes and possible remedies of this state ot agricultural inferiority. And let me here at once remark, that it is lamentable and humiliating that it should be necessary to discuss such a topic as the exhaustion of *American lands;* of lands of

great natural fertility, which have not been in cultivation, on an average, for half a century, while soils, not naturally more fertile, are known to have been in culture in Europe for at least 2,000 years, and in China for a much longer period, yielding at this day far larger returns than do our own lands which are, as it were, fresh from the creation! It is my belief that the main cause of our inferior production is to be found in the sparseness of population. There are undoubtedly several others, but they are nearly all more or less dependent upon this first and principal cause. I would add that, as the population of the United States is increasing at a ratio probably unprecedented in the history of man in so extended an area, we have every reason to hope that the evil is constantly and rapidly being corrected.

As long as there shall remain vast tracts of unoccupied virgin soil, of exceeding fertility, to be had for a low price, so long must agriculture be carried on in a loose and careless manner, particularly in the neighborhood of those lands. If this be denied to be the cause, we must ascribe the fact to other influences; but what other cause shall we name? The fertility of American soil is proverbial, and we therefore cannot look for the deficiency in that direction. Neither can we ascribe it to the climate, for although our winters are severe at the North, yet our summers are genial, and sunshine and rain fall upon the land, and forward the growth of plants as beneficently here as in any other section of the earth. Nor can we find the cause in our political institutions, for they are acknowledged to be as paternal and as liberal as any ever devised for the welfare and happiness of man. Neither can it be found in our religious institutions, for I believe no other people are so free in this respect as those of the United States. Nor yet in exorbitant and discouraging taxation; in this particular we are more favored than those nations which surpass us in the comparative amounts of their products. It is thought by some that one great reason is to be found in the absence of sufficient protection to American industry, and the consequent tendency of too great a proportion of our people, who otherwise would pursue other employments, to seek their support in the cultivation of the soil. There may be something in this, and it may be one of the causes, but yet I do not think it the greatest; for, suppose the population of this country to be proportionately as large as that of France or of England, every one at once perceives that then the tariff question would only be important as affording means to keep the governmental machinery in motion, and could not have a very serious bearing upon the agricultural production of the country. As it is, however, that question is undoubtedly important to us, until our population shall become thus large. Among other reasons, one is, that the most profitable farming combines various kinds of produce, many of which are of such character that they must be consumed at or near home, as they will not, by their intrinsic value as compared to bulk and weight, bear transportation to any great distance, or cannot safely bear transportation at all. In either class, would be found many of the articles which help to make up the farmer's profits, such as eggs,

poultry, milk, butter, hay, all the articles comprehended by the general name of *vegetables*, tender fruits, and several kinds of grain, which it is here unnecessary to enumerate. These never pay unless there is a demand for them at or near the place where they are produced. Without such a demand, it is unprofitable to cultivate these articles at all. Thus we are debarred from growing the very articles which would be least exhausting to our lands.

Probably the worst effect of our present system of exchange of products, with few exceptions, with other nations upon the agriculture of this country is, that in return for their goods, which have great value in a small bulk, we annually send to them thousands of tons of highly fertilizing elements which a wise system would require to be returned to the land for repeated production.* Other nations, England especially, import at great cost guano and other fertilizers, the expenditure for which is well repaid; while we, boasting the richness of our so-called inexhaustible lands, are blindly shipping away a constant stream of the most concentrated and valuable manures in the form of cotton, tobacco, wheat and Indian corn; and while they, with sedulous care, are constantly making their naturally poor lands richer, we are every year rendering our rich lands poorer.

However large may be the individual profits accruing from such a foreign commerce, the nation must be a loser; for, agriculturally speaking, other nations are constantly adding to their capital, while we are surely, and more rapidly than is generally believed, growing poorer and poorer—we reap the shadow, they harvest the substance.

I have said that the main reason of our agricultural inferiority was to be found in the sparseness of our population. Now, it is evident that if the density of that population were three or four times greater, or even six times, as will eventually be the caso, the home demand would absorb a much larger proportion of the agricultural products of our land, if not the whole of them, and the exhausting tendency of our foreign commerce would then be obviated, or at least greatly lessened. And here we may observe that the most populous coun-

* The amounts of breadstuffs of all kinds, exclusive of rice and potatoes, imported and exported from the United States during the fiscal year ending June 30, 1858, are as follows:

Foreign imports free of duties	$5,395,933
Foreign imports paying duties ad valorem	95,964
Total imports	5,491,897
Domestic exports	33,698,490
Foreign exports	21,517
Total exports	33,720,007
Excess of exports	28,228,110

D. J. B.

tries of the globe never export bread-stuffs or other agricultural produce to any great extent, but rather import them, their exports consisting mostly of manufactured articles, in great part derived from the bowels of the earth, or, if produced by agriculture, the greater part of their value being conferred by mechanical labor.

The Western States have few manufacturing establishments, certainly not sufficient to consume any considerable portion of the surplus of Cereals and other provisions; consequently, they have no home demand, as in populous manufacturing districts. A large portion generally remains after supplying the domestic consumption, which must seek distant markets; the greater part of which goes to Europe and other foreign parts. Agricultural produce is bulky, and cannot be transported four or five thousand miles, partly inland, without reducing its value to a comparatively low price where it is raised. This is one of the principal causes of the present depressed state of the agricultural interest in the West; and as long as this cause remains active, so long will there be a lack of inducement for Western farmers to make the earth yield supplies to its utmost capacity. At the same time that the want of home markets keeps the price of Western produce down, (except when European crops are short,) the cheapness of Western lands prevents the wages of labor being lowered to a price corresponding with that of agricultural commodities; for when laborers do not receive sufficient wages for their services, there is to them a ready remedy in the public lands, from which they can preempt a farm upon one year's credit, or, if they have savings, they can at once purchase homesteads. This state of things, happy as it undoubtedly is in one sense, by giving facility to the poor man to secure a farm, has, however, this bad effect upon the agricultural improvement and thorough culture of the soil, that, by keeping the price of labor at a higher point than the productive value of that labor warrants, it causes the farmer to cultivate a large surface of land as cheaply and rapidly as possible, rather than a smaller surface in a slow and thorough manner; the interest on the capital invested in the land on which the crops are raised being comparatively a secondary consideration, for the cost of the produce is almost entirely made up of the labor expended in producing it.

In densely-populated countries, this order of things is reversed. There the land is so expensive that it seldom yields more than 3 per cent. upon its cost, while the wages of labor are low on account of its superabundance. Therefore, the land owner must, from necessity, maintain the fertility of his fields by exacting for them the most complete culture and the highest manuring, which he is enabled to do by the cheapness of labor and the high price he can almost invariably obtain for his products.

I have said that the American farmer is compelled to cultivate as large a surface as he can. This necessity is attended with another evil, which greatly detracts from the general production, namely, the scarcity of laborers at harvest-time, which often makes it impracticable for him to secure his grain or hay as well as he would, had he

abundant labor at his command. Our harvest-fields are frequently made, from necessity, a sort of race-course, where every man strives with his neighbor to reap or bind fast, regardless of the large proportion of grain, sometimes amounting to one-eighth, or even more, of the whole crop, which is wasted or lost. In Europe, everything is saved, mostly by the farmer, but also by poor people and children, who glean every ear which has escaped his careful gathering. Our comparative deficiency of production is made to appear, by this cause, even larger than the reality. Another consequence of the scarcity of labor is, that, in general, our lands, not being so well prepared for the reception of seed, a greater amount is required; making probably a difference of half a bushel of wheat per acre. This, trifling as it may seem, must make a difference of at least 3,000,000 bushels in the aggregate production of the United States. Much more seed might be saved by the use of drilling machines, which, leaving the grain at equal distances in the ground, will seed it sufficiently, and better than could be done by hand, with about one-quarter of the amount usually put in. Such machines are deserving of all favor, when we reflect that their use largely enhances the crop, and that seed-wheat absorbs every year about one-eighth of the produce of the preceding season. Their general introduction would probably save 12,000,000 bushels of wheat annually, which, being already earned, and past contingencies of seasons or other risks, would represent at least 18,000,000 of bushels in prospect.

In the United States, we have decidedly better harvesting weather than they have in Western Europe, yet, for want of sufficient help, with large amounts of grain and of hay exposed to storms, a much greater proportion is injured or destroyed from wet here than there. Many million bushels of grain are yearly lost in the United States from this single cause. However, the recent introduction of reaping machines, which save the grain as perfectly as could be done with the most careful hand-labor, and at far less expense, is doing much to remedy some of these evils, where the nature of the land is such that they can be used; that is, where neither stumps nor stones stand in the way. These machines performing with five or six men as much work as double that number could do without them, have the effect of making laborers more abundant at harvest-time.

Another injurious consequence of a sparse population is an excess of birds and wild animals, which prey upon the husbandman's crops, fruit, poultry, and stock.

Generally, American farms are undoubtedly too large, especially at the West, for them to receive the high culture required for their production of so large a yield to the acre as they are able to produce. Too much is attempted, to be done thoroughly. Manure collection and the preparation of composts are not so much attended to as they deserve. We rely too much upon what we are pleased to term the "inexhaustible fertility of our soil." I am told that some forty years ago, the French settlers about Detroit were in the habit of depositing the manure that accumulated about their stables, in large heaps,

upon the ice of the river, which was the most expeditious way of getting rid of what they deemed a nuisance. Others thought it cheaper to remove the stables themselves rather than the rich heaps which obstructed access to them. I have seen in Wisconsin what I consider a scarcely less objectionable practice, setting fire to the straw after the grain has been threshed—a practice which is still prevailing to some extent on the prairies. A more exhausting and ruinous course could hardly be imagined. The consequence of all this is, that our lands, which, under proper management and a judicious rotation, would be capable of yielding average crops of wheat of 25 to 35 bushels and upwards to the acre, seldom realize, one year with another, more than 14 bushels—a sad state of things, when we reflect that the average yield of naturally poorer soils in England and Scotland is not less than 33 bushels.

A want of system in the distribution of the labors of the farm, and in the application of the principles or dictates of true economy, is so evident everywhere at the West, that the mere mention of the fact is sufficient to entitle it to be classified as one of the causes of our agricultural deficiency.

Everything considered, sheep are perhaps the most valuable of the domestic animals reared on our lands, on account of their little cost and large returns, and also by their improving greatly the land on which they graze. How, then, shall we qualify the fact that many of our prominent farmers have been compelled to abandon this branch of industry on account of the depredations of dogs and wolves? This evil demands the interference of State legislation.

Another defect in our agricultural practice is the apparent absence of a knowledge of causes and effects which generally prevails. As long as the land under tillage seems capable of producing the few articles which are raised by farmers here, mostly wheat, corn, potatoes, and oats, so long are they intrusted to the soil with the expectation that the yield will be as large as when the land possessed its original fertility; and when, as is almost sure to happen, the expectations formed are not realized, the blame is laid to the extreme dryness or moisture, to heat or cold, or perhaps to the baneful influence of the moon—to everything in fine, but the true reasons, neglect to restore to the land those elements of fertility of which the soil has been robbed by former crops, the want of sufficient tillage, and of proper rotation.

In view of the rapid impoverishment of our lands, it does not require prophecy to foretell that, if the destruction of the human race is ever to take place, it will surely come by the absolute exhaustion of the elements of vegetable productiveness in that land which a beneficent Being has given us for an abode and an inheritance. It will surely come when the earth shall be barren and desolate, made so by the sordid avarice of the very men who had the mission to adorn it and make it more fruitful. It will come through the *starvation* of the last descendant of Adam in the last once fruitful and smiling, then barren and desolate valley.

It would, indeed, be a singular fact, if it were true, that out of the many varieties of plants which the earth produces, only four or five could be raised with profit. In reality, wheat and corn are about the only articles which are thought to be capable of profitable transportation to an Eastern market; the Western farmer, whose groceries and dry goods almost invariably come from that quarter, is obliged to raise these two staples, which nearly alone supply such an exchange. This commerce, for many causes, has a tendency to keep the Western States poor and to depress their agriculture.

In spite of these drawbacks, how much cause we have for encouragement in the present, how great reason to hope for the future! Let us but think of what has been achieved in the past—how many cities have been built—how many millions of acres have been subdued and made to contribute to the comfort and happiness of man within a single generation. Would it be reasonable, even in this fast age, to be dissatisfied with vast and valuable results—far outstripping those of any century since the creation of man—because we have failed, as yet, to equal the degree of perfection attained in countries having for their inheritance the accumulated capital and labor of centuries? Surely not. Everything cannot be done at once. Agricultural perfection is the work of time. The forest must first be cleared; the stones be removed; the sod broken; the marsh improved; the swamp drained and reclaimed; buildings erected; fences built; roads opened and made passable; school-houses constructed and endowed, and agricultural science disseminated among the people.

The Annual Reports of the Patent Office and the agricultural papers throughout the Union are doing much to promote rural industry, and make known the various defects of our practices. But they are hardly sufficient. A more permanent good could be done to the rising generation by the establishment, in every State, of an agricultural college with an experimental farm, endowed with sufficient liberality, where farming would be taught, both as a science and as a mechanical operation—where theory should be constantly confirmed by practice. In these institutions, many plants might be cultivated; native grapes, for instance, which, resisting the severity of our winters, might, by proper management, be made to produce wine with certainty, without danger of being killed by frost; an experiment worth trying, but which few individuals would undertake on a sufficiently large scale, for fear of want of success and consequent severe loss. Many other experiments might be mentioned, which, if successful, would greatly add to the wealth and comfort of the people.

It may not be out of place here to observe that the nations which thrive most by their agriculture are those that cultivate the greatest variety of products; for, when one article fails, another may succeed and make up for the deficiency. A season may be unfavorable for wheat or potatoes, and good for corn; or unsuitable for the three, and yet good for fruit, vegetables, and grass. Hence the people who cultivate the greatest number of staples, have probably seldom, if ever, occasion to lament, as we sometimes do, an almost total failure

of crops. At any rate, one important point would certainly be gained; that inasmuch as farmers are predisposed to follow a routine from which it is difficult to move them, their children, educated at these agricultural colleges, would work by the teachings of science or common sense, and better methods than now prevail would be certain to be speedily adopted. These institutions, with their libraries and other appendages, would remedy a great evil among us, who are. properly speaking, an agricultural people. In general, the agriculturist is not so liberally educated as men belonging to other professions, although, probably, no other calling really requires such extensive and varied knowledge of the laws and secrets of Nature.

FOREIGN COMMERCE OF THE UNITED STATES RESULTING FROM AGRICULTURE.

The following tables exhibit the principal agricultural products of foreign and domestic growth, with some of the results of the manufactures therefrom, and other important articles, imported into and exported from the United States during the fiscal years 1851 to 1858, inclusive, as condensed from the Reports of the Secretary of the Treasury. Wherever blanks occur in the tables, it is to be either understood that there were no imports or exports named, or that they were classified with other articles in the aggregate, or under different denominations:

D. J. B.

IMPORTS AND EXPORTS.

Synopsis of the principal agricultural products of foreign and domestic growth, with some of the results of the manufactures therefrom, and other important articles imported into and exported from the United States, during the fiscal years 1851 to 1858, inclusive.

CLASSIFICATION.	1851.	1852.	1853.	1854.	1855.	1856.	1857.	1858.
Animals and their products—								
Animals imported for breed, value of ...... dollars	88,965	75,727	56,559	161,298	103,921	99,263	48,345	
Animals of all kinds, imported, value of ...... dollars								81,331
Animals for breed, foreign, exported, value of ...... dollars							600	
Beeswax, domestic, exported ...... pounds	415,923	326,368	376,693	327,554	257,415	270,320	315,378	366,946
Value of ditto ...... dollars	122,835	91,499	113,602	87,140	69,905	74,005	91,983	85,926
Honey, imported ...... gallons					437,159	428,536	414,659	399,199
Value of ditto ...... dollars					138,189	169,643	202,436	149,915
Honey, foreign, exported ...... gallons					238,978	201,709	310,603	159,727
Value of ditto ...... dollars					109,087	117,091	208,971	103,395
Cattle, horned, domestic, exported ...... number	1,350	1,078	1,076	23,692	1,501	2,478	4,325	26,247
Value of ditto ...... dollars				1,022	84,680	133,743	144,840	1,238,769
Beef and pork, imported ...... pounds	41,276	646,722	748,300	212,040	158,397	7,054	36,323	309,4 0
Value of ditto ...... dollars	1,667	31,778	26,766	12,723	6,194	622	2,614	12,201
Beef and pork, foreign, exported ...... pounds	25,000	159,320	357,000	188,985	146,723	1,400	8,600	64,800
Value of ditto ...... dollars	937	6,373	25,599	10,593	10,138	75	860	3,259
Beef, domestic, exported ...... barrels and tierces	90,648	122,259	126,041	126,220	113,994	103,791	70,375	100,957
Value of ditto ...... dollars					2,600,547	1,963,151	1,218,348	2,081,856
Butter, imported ...... pounds	479,180	963,499	2,830,526	1,377,765	1,485,209	88,453	106,733	36,055
Value of ditto ...... dollars	37,536	79,883	330,336	164,589	97,658	16,443	18,654	5,757
Butter, foreign, exported ...... pounds	60,602	2,557	486,243	313,447	605,211	19,358	153,511	19,050
Value of ditto ...... dollars	7,661	320	98,932	58,976	103,072	2,747	29,014	2,860
Butter, domestic, exported ...... pounds	3,994,542	2,222,264	2,658,911	3,774,634	2,315,249	2,936,491	3,141,592	3,082,117
Value of ditto ...... dollars					418,723	580,986	593,084	541,863
Cheese, imported ...... pounds	603,398	514,337	874,949	969,417	1,596,942	1,384,272	1.400,252	1,589,666
Value of ditto ...... dollars	54,852	44,859	70,528	93,152	146,269	141,169	143,821	152,272
Cheese, foreign, exported ...... pounds	3,452	11,177	3,948	18,906	113,019	13,900	6,067	5,235
Value of ditto ...... dollars	521	2,279	854	3,278	11,592	2,846	1,390	903
Cheese, domestic, exported ...... pounds	10,361,189	6,650,420	3,763,932	7,003,974	4,846,568	8,737,029	6,453,072	8,098,527
Value of ditto ...... dollars					514,034	887,705	647,423	731,910
Butter and cheese, domestic, exported, value of ...... dollars	1,194,652	779,391	862,343	1,258,393	932,757	1,467,991	1,240,507	1,273,773
Candles, wax or spermaceti, domestic, exported ...... pounds	538,549	397,398	343,992	255,825			104,576	
Value of ditto ...... dollars	195,916	143,098	112,600	77,991			35,121	
Candles, adamantine, stearine, and tallow, domestic, exported ...... pounds	3,227,633	3,612,402	2,772,188	3,389,577	4,014,457	4,398,859	4,150,570	3,784,557
Value of ditto ...... dollars					699,141	766,588	677,398	626,599
Candles, stearine, imported ...... pounds	39,435	45,229	22,045	58,443	63,972	225,030	314,520	173,867
Value of ditto ...... dollars	7,531	10,870	4,414	11,756	14,467	50,811	62,187	34,466
Candles, stearine, foreign, exported ...... pounds	19,200	13,536	20,906		19,579	8,879	33,744	3,235
Value of ditto ...... dollars	5,490	3,364	4,611		5,204	2,690	7,036	668
Candles, tallow, imported ...... pounds	400	2,450	28,037	7,201				
Value of ditto ...... dollars	28	283	3,017	669				

Synopsis of the principal agricultural products of foreign and domestic growth—Continued.

Classification.		1851.	1852.	1853.	1854.	1855.	1856.	1857.	1858.
Animals and their products—Continued.—									
Candles, tallow, foreign, exported	pounds	1,645		22,326	6,500				
Value of ditto	dollars	117		2,125	650				
Candles, tallow, domestic, exported	pounds	3,237,633	3,612,002	2,772,188	3,380,577				
Value of ditto	dollars								
Candles, wax and spermaceti, imported	pounds	46,944	8,187	21,332	172,841	18,818	28,803	31,502	26,343
Value of ditto	dollars	16,215	2,015	6,204	33,359	6,315	8,388	9,667	8,731
Candles, wax and spermaceti, foreign, exported	pounds	1,645			2,872	8,106	7,170		3,794
Value of ditto	dollars	117			690	2,027	1,949		1,688
Combs and buttons, domestic, exported, value of	dollars	27,354	28,833	31,395	37,493	32,049	32,653	39,799	46,349
Glue, imported	pounds	356,110	194,034	138,106	211,918	121,832	340,252	220,588	117,566
Value of ditto	dollars	28,393	17,797	10,952	17,295	13,209	30,745	23,571	14,637
Glue, foreign, exported	pounds			1,239		12,881			940
Value of ditto	dollars			161		688			188
Hides and skins, raw, imported, value of	dollars	5,964,838	4,823,119	5,919,391	7,620,272	8,048,015	8,083,292	10,010,090	9,884,358
Hides and skins, raw, foreign, exported, value of	dollars	103,638	101,044	67,632	179,793	304,068	101,924	277,590	1,280,868
Hides, domestic, exported	number	86,624	55,421	25,955	23,628	114,787	40,184	153,746	
Value of ditto	dollars					361,982	101,174	624,867	875,753
Leather, sole and band, imported	pounds	101,980	103,325	123,737	135,183				
Value of ditto	dollars	24,308	32,660	26,267	50,147				
Leather, tanned, band, sole and upper, imported	pounds					2,947,977	4,519,651	3,328,936	2,977,453
Value of ditto	dollars					1,252,369	1,913,967	1,606,458	1,259,711
Leather, skivers, imported	dozen	10,493	1,021	8,368	10,099	14,762	13,599	12,457	6,983
Value of ditto	dollars	41,909	7,514	39,760	50,433	68,496	69,212	68,194	35,976
Leather, tanned, band, sole and upper, foreign, exported	pounds					150,429	23,002	1,500	4,965
Value of ditto	dollars					29,915	5,392	435	3,066
Skins, tanned and dressed, foreign, exported	dozen	404	526	819	1,291	818	502	288	7,587
Value of ditto	dollars	7,507	7,871	12,233	10,258	6,153	7,341	5,119	48,949
Skins, tanned and not dressed, foreign, exported	dozen				5				
Value of ditto	dollars			249	117				
Leather, domestic, exported	pounds	922,676	966,519	1,172,561	1,763,066	1,488,385	972,768	1,746,546	2,505,367
Value of ditto	dollars					288,867	252,344	497,714	605,589
Morocco and other leather, not sold by the pound, domestic, exported, value of	dollars	13,309	18,617	6,448	15,882	36,045	5,765	2,119	13,099
Boots and shoes, leather, imported	pair	42,291	44,573	70,268	79,334	65,263	66,821	78,205	39,826
Value of ditto	dollars	54,227	60,693	92,204	101,803	90,813	136,372	127,651	87,101
Boots and shoes, leather, foreign, exported	pair	5,755	7,594	19,017	51,994	20,395	15,496	961	2,062
Value of ditto	dollars	3,792	5,328	15,365	40,229	21,136	19,600	899	2,340
Boots and shoes, leather, domestic, exported	pair	282,676	302,474	440,709	455,650	616,104	683,149	561,501	609,969
Value of ditto	dollars					763,539	1,060,967	813,995	663,905
Boots, shoes, and slippers, in which leather forms a part, imported	pair	296		2,525	9,396	23,417	81,116	77,787	82,610
Value of ditto	dollars	166		2,196	9,814	12,520	32,742	30,525	30,754
Boots, shoes, and slippers, in which leather forms a part, foreign, exported	pair	2,236	1,225		9,396	1,832	5,641	17,019	3,092
Value of ditto	dollars	855	1,125	913	9,814	2,264	3,894	7,749	9,576

Leather, other manufactures of, imported, value of	dollars	1,589,384	1,513,673	1,650,745	1,663,717	1,922,151	1,654,793	2,018,493	1,728,618
Leather, other manufactures of, foreign, exported, value of	dollars	2,833	11,073	11,401	14,764	36,060	40,964	10,103	4,420
Oil, fish, except sperm, imported	gallons	3,290	8,803	541,332	943,290	103,394	18,329	36,289	....
Value of ditto	dollars	1,281	3,847	255,781	116,518	36,297	7,971	17,280	....
Oil, fish, except sperm, foreign, exported	gallons	....	950	53,106	37,316	4,179	12,693	318	....
Value of ditto	dollars	....	484	30,840	22,811	3,399	7,401	380	....
Oil, fish, except sperm, domestic, exported	gallons	2,004,886	892,309	321,989	718,842	706,492	646,694	414,466	840,127
Value of ditto	dollars	882,485	440,287	223,247	490,426	485,505	526,338	363,665	527,107
Oil, lard, domestic, exported	gallons	....	....	....	....	103,200	212,262	91,432	....
Value of ditto	dollars	....	....	....	....	82,945	161,232	92,499	....
Oil, neatsfoot and other animal, imported	gallons	22,208	29,654	34,412	21,067	5,284	265	453	8,195
Value of ditto	dollars	11,149	11,639	14,333	1,953	2,899	276	153	4,127
Oil, neatsfoot and other animal, foreign, exported	gallons	....	....	....	10,858	182	50	42	6,850
Value of ditto	dollars	....	....	....	5,537	180	90	50	8,006
Oil, sperm or other fish, imported	gallons	10	....	8	44	450	41	269	....
Value of ditto	dollars	10	....	7	52	353	73	413	199,258
Oil, sperm or other fish, foreign, exported	gallons	3,148	....	....	20	43	150	590	....
Value of ditto	dollars	3,778	....	....	25	70	225	1,030	10,760
Oil, sperm, domestic, exported	gallons	905,778	644,765	1,131,098	847,535	958,744	540,784	819,091	896,923
Value of ditto	dollars	1,044,967	809,274	1,418,845	1,105,907	1,593,832	977,005	1,216,898	1,097,505
Soap, imported	pounds	1,336,103	938,825	1,329,793	1,980,366	3,201,667	3,859,915	2,688,483	1,219,320
Value of ditto	dollars	62,616	51,502	80,494	117,607	198,879	263,955	191,433	90,301
Soap, foreign, exported	pounds	2,900	1,570	2,830	11,350	139,259	104,762	50,969	43,414
Value of ditto	dollars	159	141	283	817	10,787	7,176	3,753	1,922
Soap, domestic, exported	pounds	4,988,378	4,233,481	5,190,880	5,445,869	7,714,943	6,348,298	7,484,085	4,738,981
Value of ditto	dollars	....	....	....	....	412,208	434,176	530,085	305,704
Soap and tallow candles, domestic, exported, value of	dollars	609,732	660,054	681,362	888,557	....	....	....	....
Tallow, imported	pounds	201,165	21,354	817,245	37,406	53,445	41,847	166,548	92,687
Value of ditto	dollars	12,306	1,320	64,114	2,177	3,777	3,022	12,507	7,413
Tallow, foreign, exported	pounds	66,440	....	100,626	1,646,379	....	....	55,457	37,759
Value of ditto	dollars	1,510	....	9,506	174,000	....	....	3,533	3,269
Tallow, domestic, exported	pounds	8,198,278	4,767,020	3,926,598	9,325,471	11,866,992	7,458,471	5,698,315	8,283,812
Horned cattle, beef, tallow, and hides, domestic, exported, value of	dollars	1,689,968	1,500,429	2,214,554	2,757,022	....	....	....	....
Fish, dried or smoked, imported	pounds	1,646,960	5,521,488	10,920,784	8,520,288	12,534,256	7,388,416	4,927,328	4,608,912
Value of ditto	dollars	27,769	55,171	214,016	181,469	265,934	158,233	96,607	111,709
Fish, dried or smoked, foreign, exported	pounds	1,771,280	1,598,198	5,687,920	5,623,184	5,732,160	4,814,320	4,973,360	3,515,680
Value of ditto	dollars	41,585	41,232	156,162	171,975	191,322	170,841	152,689	113,564
Fish, dried or smoked, domestic, exported	pounds	16,921,856	15,069,984	14,746,480	14,707,392	13,431,712	18,224,752	19,573,680	18,062,128
Value of ditto	dollars	367,729	354,127	371,607	389,973	379,892	578,011	570,348	487,007
Fish, herrings and shad, imported	barrels	21,714	26,696	66,584	61,485	46,902	3,587	8,831	....
Value of ditto	dollars	54,449	73,584	159,027	158,348	129,938	22,808	49,213	....
Fish, herrings and shad, foreign, exported	barrels	10,300	12,877	17,180	12,159	1,880	10	106	....
Value of ditto	dollars	38,295	51,047	63,530	48,774	7,300	45	962	....
Fish, mackerel, imported	barrels	102,638	78,334	54,411	62,499	80,990	81	20	45
Value of ditto	dollars	549,525	327,613	329,233	477,131	432,431	131	144	369
Fish, mackerel, foreign, exported	barrels	18,240	23,679	15,210	13,898	14,556	9,374	6,897	3,130
Value of ditto	dollars	85,871	111,045	103,068	95,479	83,156	50,025	48,770	26,009
Fish, salmon, imported	barrels	7,964	7,947	7,235	6,810	6,316	685	700	337
Value of ditto	dollars	85,705	96,526	94,341	94,335	86,796	3,106	3,949	2,446
Fish, salmon, foreign, exported	barrels	530	56	173	219	334	144	75	362
Value of ditto	dollars	3,642	735	2,781	2,967	4,704	2,027	600	2,799
Fish, all other, imported	barrels	21,016	20,083	31,153	41,652	25,050	454	706	980
Value of ditto	dollars	64,022	65,993	90,143	140,824	86,231	2,658	4,633	5,209

Synopsis of the principal agricultural products of foreign and domestic growth—Continued.

CLASSIFICATION.	1851.	1852.	1853.	1854.	1855.	1856.	1857.	1858.
Animals and their products—Continued.—								
Fish, all other, foreign, exported ....barrels..	853	847	1,995	8,970	17,942	11,003	12,608	15,283
Value of ditto ....dollars..	3,966	3,461	7,478	39,718	64,199	48,929	59,564	71,098
Fish, pickled, domestic, exported ....barrels..	21,214	19,379	14,807	25,909	16,988	30,801	35,759	30,470
Fish, pickled, domestic, exported ....kegs..	3,215	1,940	2,027	3,673	1,505	4,065	2,313	3,375
Value of ditto, in barrels and kegs ....dollars..	113,932	98,883	89,409	162,187	94,111	173,939	211,383	197,441
Spermaceti, domestic, exported ....pounds..	....	....	....	....	177,354	51,876	80,987	....
Value of ditto ....dollars..	....	....	....	....	45,411	16,408	34,917	....
Whalebone, domestic, exported ....pounds..	2,281,931	1,184,156	2,825,069	2,156,864	1,944,809	1,982,800	2,042,390	1,103,301
Value of ditto ....dollars..	689,602	437,673	1,063,705	817,817	781,680	1,036,647	1,307,322	1,105,223
Horses, domestic, exported ....number..	1,364	1,550	1,390	1,241	1,003	2,250	1,631	2,154
Mules, domestic, exported ....number..	2,946	1,233	1,337	903	912	1,144	1,624	2,261
Horses and mules, domestic, exported, value of ....dollars..	198,155	247,550	246,731	200,098	191,904	323,972	366,816	527,068
Sheep, domestic, exported ....number..	4,357	2,968	3,669	2,642	4,235	3,520	4,373	....
Value of ditto ....dollars..	18,875	16,291	17,808	15,194	18,837	18,802	22,758	49,319
Wool, imported ....pounds..	32,548,491	18,341,298	21,595,079	20,200,110	18,534,415	14,737,393	16,502,060	....
Value of ditto ....dollars..	3,833,157	1,930,711	2,669,718	2,822,185	2,072,139	1,665,064	2,125,744	4,022,635
Wool, manufactures of, wholly or in part, except those included in slippers and shoes, imported, value of ....dollars..	21,290,385	19,241,207	29,502,829	33,976,632	25,537,988	33,297,040	32,866,364	27,735,476
Wool, manufactures of, wholly or in part, except those included in slippers and shoes, foreign, exported, value of ....dollars..	272,686	263,163	347,970	1,283,934	2,446,258	1,271,595	438,667	227,364
Silk, floss and raw, imported, value of ....dollars..	456,449	378,747	722,931	1,099,339	751,617	1,007,732	984,346	1,300,065
Silk, piece goods, imported, value of ....dollars..	22,178,379	16,893,528	22,470,911	25,296,519	20,069,957	25,200,651	22,067,369	17,791,569
Silk, sewing, imported, value of ....dollars..	379,455	173,799	238,595	332,301	189,290	250,138	211,723	111,912
Bolting cloths, imported, value of ....dollars..	28,541	47,052	40,232	48,868	56,984	70,146	57,602	107,612
Silk, manufactures of, wholly or in part, except silk and worsted and slippers and shoes, imported, value of ....dollars..	3,315,837	4,725,039	7,817,405	9,306,131	4,095,476	4,715,567	5,444,486	3,735,417
Bolting cloths, foreign, exported, value of ....dollars..	225	....	837	1,830	873	1,965	....	23
Silk, piece goods, foreign, exported, value of ....dollars..	417,758	523,700	507,707	563,529	512,462	268,917	91,159	15,386
Silk, floss and raw, foreign, exported, value of ....dollars..	43,856	7,143	282	27,966	71,192	4,255	4,368	94,092
Silk, sewing, foreign, exported, value of ....dollars..	8,586	5,006	5,426	17,073	34,003	10,723	6,135	5,831
Silk, other manufactures of, wholly or in part, except silk and worsted and slippers and shoes, foreign, exported, value of ....dollars..	85,192	87,312	131,801	289,663	354,797	284,013	59,687	229,742
Swine, domestic, exported ....number..	1,030	185	22	279	431	1,391	923	96,000
Value of ditto ....dollars..	....	....	....	....	2,192	6,331	5,525	810,406
Bacon and hams, imported ....pounds..	136,973	177,169	81,149	68,691	75,216	68,405	48,263	18,962
Value of ditto ....dollars..	13,456	13,358	7,455	8,419	9,411	9,551	7,204	1,725
Bacon and hams, foreign, exported ....pounds..	3,288	10,159	48,137	....	....	2,140	....	....
Value of ditto ....dollars..	312	993	5,055	....	....	1,369	....	....
Bacon and hams, domestic, exported ....pounds..	18,027,302	5,746,816	18,390,027	45,953,473	38,188,989	41,748,092	43,863,539	20,954,374
Value of ditto ....dollars..	....	....	....	....	3,195,978	3,863,398	4,511,441	1,957,423
Pork, domestic, exported ....barrels and tierces..	165,906	83,382	129,881	220,147	294,440	279,153	144,292	157,098
Value of ditto ....dollars..	....	....	....	....	4,390,979	5,029,940	2,805,867	2,852,942
Bristles, hogs', imported ....pounds..	465,645	464,918	389,200	659,353	507,847	376,869	470,845	443,797
Value of ditto ....dollars..	244,694	313,130	253,731	349,154	315,112	243,964	269,581	265,720

Bristles, hogs', foreign, exported	pounds	966	213	......	......	190	1,800	2,000	2,531
Value of ditto	dollars	478	155	......	......	275	1,172	2,072	2,737
Brushes and brooms, imported, value of	dollars	156,413	143,192	199,780	226,261	189,260	252,043	251,908	170,078
Brushes and brooms, foreign, exported, value of	dollars	698	50	621	13,567	4,081	5,583	1,013	155
Brushes and brooms of various kinds, domestic, exported, value of	dollars	8,957	4,385	6,612	9,486	10,876	8,385	7,324	42,153
Lard, imported	pounds	2,672	61,068	16,130	150,868	113,6[illegible]8	1,258	4,500	7,961
Value of ditto	dollars	131	5,987	916	19,728	9,914	109	420	522
Lard, foreign, exported	pounds	......	......	......	11,646	200	......	24,616	310
Value of ditto	dollars	......	......	......	1,165	20	......	2,152	46
Lard, domestic, exported	pounds	19,693,082	21,281,951	24,435,014	44,450,154	39,025,492	37,582,271	40,246,544	31,029,286
Value of ditto	dollars	......	......	......	......	4,018,016	3,870,949	5,144,195	3,809,501
Hogs, pork, bacon, hams and lard, domestic, exported, value of	dollars	4,266,015	3,765,470	6,202,394	11,061,016	11,607,165	12,770,548	12,467,029	9,430,952
Skins and furs, domestic, exported, value of	dollars	977,762	798,504	796,101	888,531	709,531	932,459	1,116,041	1,002,378
Beer, ale, porter, cider and vinegar—									
Beer, ale and porter, imported, in casks	gallons	93,564	18,138	52,908	319,805	481,934	442,103	538,642	360,140
Value of ditto	dollars	41,046	8,841	26,933	134,117	194,765	190,554	221,260	146,095
Beer, ale and porter, imported, in bottles	gallons	264,028	361,877	436,541	750,676	796,183	722,989	927,042	734,223
Value of ditto	dollars	200,848	248,599	338,559	432,892	657,808	530,343	628,550	485,039
Beer, ale and porter, foreign, exported, in casks	gallons	1,500	69	......	8,461	10,900	26,503	94,784	52,387
Value of ditto	dollars	542	30	......	4,771	4,498	10,069	36,466	21,588
Beer, ale and porter, foreign, exported, in bottles	gallons	4,932	3,673	1,546	5,961	11,446	6,662	14,451	17,288
Value of ditto	dollars	3,915	3,947	1,602	4,802	6,430	5,444	10,135	11,456
Beer, ale, porter and cider, domestic, exported, in casks	gallons	143,014	111,372	133,979	118,069	84,194	108,916	107,605	168,719
Beer, ale, porter and cider, domestic, exported, in bottles	dozens	15,122	13,058	17,390	16,702	13,615	10,139	7,714	15,692
Beer, ale, porter and cider, domestic, exported, value of	dollars	57,975	48,052	61,677	53,385	45,069	45,066	43,732	50,5[illegible]2
Vinegar, imported	gallons	46,925	78,209	43,046	47,072	......	......	......	......
Value of ditto	dollars	5,801	9,164	6,975	10,944	......	......	......	......
Vinegar, foreign, exported	gallons	1,228	1,687	930	4,747	......	......	......	......
Value of ditto	dollars	943	413	211	614	......	......	......	......
Vinegar, domestic, exported, value of	dollars	16,915	12,220	20,443	16,945	17,281	26,034	30,788	21,336
Breadstuffs—									
Barley, imported	bushels	95,063	100,192	109,461	73,700	155,782	1,770	2,924	9,755
Value of ditto	dollars	53,653	50,721	39,764	57,727	121,687	2,054	3,068	10,368
Barley, foreign, exported	bushels	7	......	2,597	......	50,033	2,193	......	2
Value of ditto	dollars	20	......	1,577	......	41,273	2,263	......	3
Barley, pearl, imported	pounds	282,523	7,364	4,056	26,198	......	......	......	......
Value of ditto	dollars	13,382	318	170	914	......	......	......	......
Corn, Indian, domestic, exported	bushels	3,426,811	2,627,075	2,274,909	7,768,816	7,807,585	10,292,281	7,505,318	4,766,145
Value of ditto	dollars	1,762,549	1,540,225	1,374,077	6,074,277	6,961,571	7,622,565	5,184,666	3,259,039
Corn-meal, domestic, exported	barrels	903,022	181,105	212,118	257,403	267,208	233,607	217,504	237,637
Value of ditto	dollars	622,866	574,380	709,974	1,002,976	1,237,122	1,175,648	957,791	877,692
Oats, imported	bushels	679,812	542,198	800,063	167,900	49,051	682	[illegible]	115
Value of ditto	dollars	163,448	113,198	174,658	48,884	19,148	538	110	95
Oat meal, imported	pounds	302,400	390,680	292,208	947,521	418,464	41,064	18,928	106,248
Value of ditto	dollars	6,478	5,958	4,663	4,654	8,844	900	539	3,306
Rice, domestic, exported	barrels and tierces	105,590	119,733	67,707	105,121	72,291	130,706	134,641	113,298
Value of ditto	dollars	2,170,927	2,471,024	1,657,658	2,634,127	1,717,953	2,390,233	2,290,400	1,870,578
Rye, imported	bushels	67,454	25,680	6,191	1,232	42,381	......	......	1,197
Value of ditto	dollars	23,158	9,567	1,625	979	32,601	......	......	772
Rye-meal, imported	pounds	28,752	......	......	336	22,176	......	107,520	112
Value of ditto	dollars	466	......	......	7	587	......	2,070	9
Rye-meal, domestic, exported	barrels	44,152	18,594	8,910	23,674	35,364	38,105	......	11,283
Value of ditto	dollars	145,802	64,476	34,186	112,703	236,248	214,563	......	56,236

Synopsis of the principal agricultural products of foreign and domestic growth—Continued.

CLASSIFICATION.	1851.	1852.	1853.	1854.	1855.	1856.	1857.	1858.
Breadstuffs—Continued—								
Rye, oats, and other small grain, and pulse, domestic, exported, value of ....dollars..	190,670	334,471	165,894	576,195	288,976	2,718 630	680,108	642,764
Wheat, imported ....bushels..	870,849	862,295	1,997,352	2,196,650	1,012,132	1,312	660	28,644
Value of ditto ....dollars..	609,681	558,958	821,815	2,164,191	1,456,180	2,546	909	26,651
Wheat, foreign, exported ....bushels..	451,874	605,473	953,548	1,097,113	117,490	71,333	41,843	....
Value of ditto ....dollars..	478,336	564,283	1,005,969	1,664,067	198,776	143,991	67,415	....
Wheat, domestic, exported ....bushels..	1,026,725	2,694,540	3,890,141	8,036,665	798,884	8,154,877	14,570,331	8,926,196
Value of ditto ....dollars..	1,025,732	2,555,209	4,354,403	12,420,172	1,329,246	15,115,661	22,240,857	9,061,504
Wheat flour, imported ....pounds..	55,574,512	58,008,272	59,561,376	87,105,536	56,644,112	130,032	18,256	508,256
Value of ditto ....dollars..	1,008,929	1,010,540	974,736	2,443,586	1,982,694	3,772	477	19,818
Wheat flour, foreign, exported ....pounds..	54,440,400	51,668,512	55,214,768	69,015,072	42,469,056	5,366,592	5,642,560	699,104
Value of ditto ....dollars..	1,278,943	1,084,707	1,347,539	2,643,902	1,693,264	198,870	228,677	21,514
Wheat flour, domestic, exported ....barrels..	2,202,335	2,799,339	2,920,918	4,022,386	1,204,540	3,510,626	3,712,053	3,512,169
Value of ditto ....dollars..	10,524,331	11,869,143	14,783,394	27,701,441	10,896,908	29,275,148	25,882,316	19,328,884
Biscuit, shipbread or crackers, domestic, exported ....barrels..	106,329	93,694	121,281	107,844	110,907	101,036	138,918	117,244
Biscuit, shipbread or crackers, domestic, exported ....kegs and boxes..	34,815	46,625	56,089	34,582	42,380	37,486	32,397	43,843
Biscuit, shipbread, and crackers, domestic, exported, total value of..dollars..	254,285	318,819	454,020	495,340	657,783	497,741	563,266	472,372
Starch, imported ....pounds..	41,995	61,571	770,282	51,401	44,387	32,144	118,833	52,658
Value of ditto ....dollars..	3,360	4,477	30,192	3,005	2,034	1,655	6,695	4,308
Starch, foreign, exported ....pounds..	....	1,300	....	8,500	....	2,400	....	146,500
Value of ditto ....dollars..	....	256	....	771	....	153	....	6,400
Cocoa and its products—								
Cocoa and chocolate, imported ....pounds..	2,198,600	1,372,341	3,453,268	3,162,072	2,427,707	2,017,471	2,044,637	1,810,449
Value of ditto ....dollars..	127,360	62,986	170,105	184,757	127,809	116,076	187,016	213,644
Cocoa and chocolate, foreign, exported ....pounds..	1,107,280	1,457,193	1,952,124	1,640,086	998,283	916,329	385,603	911,161
Value of ditto ....dollars..	72,251	87,737	135,212	125,339	66,638	83,766	52,801	167,060
Chocolate, domestic, exported ....pounds..	26,627	29,414	73,851	83,007	24,710	11,960	12,581	10,394
Value of ditto ....dollars..	3,255	3,267	10,230	12,257	9,771	1,476	1,932	2,304
Coffee—								
Coffee, imported ....pounds..	152,519,743	193,906,253	199,408,045	162,255,993	191,478,657	225,865,268	240,676,227	189,211,300
Value of ditto ....dollars..	12,851,070	14,474,900	15,546,966	14,549,718	16,940,400	21,573,558	22,426,758	18,369,840
Coffee, foreign, exported ....pounds..	3,527,238	13,193,666	13,368,802	12,009,590	17,313,600	19,226,789	24,020,250	14,714,139
Value of ditto ....dollars..	361,399	1,102,776	1,165,603	1,171,746	1,519,325	1,252,416	2,616,904	1,589,970
Cotton and its manufactures—								
Cotton, imported ....pounds..	157,757	244,548	722,686	545,210	2,115,367	1,096,841	802,233	....
Value of ditto ....dollars..	11,281	12,521	40,447	31,318	131,457	71,335	68,172	41,356
Cotton, foreign, exported ....pounds..	....	....	42,592	....	....	....	....	....
Value of ditto ....dollars..	....	....	2,394	....	....	....	....	....
Cotton, Sea Island, domestic, exported ....pounds..	8,299,656	11,738,075	11,165,165	10,486,423	13,058,590	12,797,225	12,940,725	12,101,058
Cotton, other, domestic, exported ....pounds..	918,937,433	1,081,492,564	1,100,405,205	977,346,683	995,366,011	1,338,634,476	1,035,341,750	1,106,522,954
Cotton, domestic, exported, total ....pounds..	927,237,089	1,093,230,639	1,111,570,370	987,833,106	1,008,424,601	1,351,431,701	1,048,282,475	1,118,624,012
Value of ditto ....dollars..	112,315,317	87,657,732	109,456,404	93,596,220	88,143,844	128,382,351	131,575,859	131,386,661
Cotton, manufactures wholly or in part of, except those mixed with wool or silk, and slippers and shoes, imported, value of....dollars..	22,941,883	20,130,024	28,513,350	34,624,606	18,426,077	27,110,546	28,818,076	18,588,288

Cotton, manufactures wholly or in part of, except those mixed with wool or silk, and slippers and shoes, foreign, exported, value of	dollars	695,237	1,019,204	1,949,858	1,549,640	2,085,737	1,601,526	575,163	396,204
Cotton, manufactures wholly or in part of, except those mixed with wool or silk, and slippers and shoes, domestic, exported, value of	dollars	7,941,905	7,672,151	8,768,894	5,535,516	5,857,181	6,967,369	6,115,177	5,651,504
Drugs, dyes, and condiments—									
Acid, acetic, imported	pounds					599,529	654,348	413,884	
Value of ditto	dollars					88,764	190,049	78,271	
Arrowroot, imported	pounds					93,591	177,295	146,372	182,435
Value of ditto	dollars					13,410	17,490	25,751	19,573
Arrowroot, foreign, exported	pounds					991		2,212	27,922
Value of ditto	dollars					167		423	2,988
Barytes, sulphate of, imported	pounds	2,342,910	1,672,051	2,012,609	2,842,217	5,985,585	12,319,896	6,782,236	3,725,392
Value of ditto	dollars	16,179	10,125	14,417	21,097	42,467	86,193	48,567	39,958
Borax, imported	pounds					647,478	807,431	574,834	434,514
Value of ditto	dollars					131,853	153,276	94,844	67,890
Brimstone, imported	pounds					25,230,305	19,212,519	16,647,895	19,317,715
Value of ditto	dollars					213,223	169,600	164,635	238,956
Brimstone, foreign, exported	pounds					1,496,614	104,313	72,050	115,755
Value of ditto	dollars					19,836	22,863	1,569	2,042
Camphor, imported	pounds	197,595	189,642	111,390	235,846	193,909	344,815	389,673	
Value of ditto	dollars	29,287	22,110	14,657	39,866	29,564	51,305	56,348	92,957
Camphor, foreign, exported	pounds	3,718	699	8,539	1,622	1,595		4,274	768
Value of ditto	dollars	787	246	3,308	529	497		1,635	387
Cassia, imported	pounds	1,028,308	1,839,675	1,295,058	1,559,012	1,413,438	1,132,118	1,432,713	1,819,458
Value of ditto	dollars	102,834	244,179	178,190	226,495	176,336	169,705	201,883	356,614
Cassia, foreign, exported	pounds	81,046	350,731	338,942		364,062	170,301	156,529	1,166,356
Value of ditto	dollars	17,037	70,023	68,938		80,781	44,037	40,658	63,841
Cinnamon, imported	pounds		26,027	36,783	27,611	52,096	85,218	85,234	84,259
Value of ditto	dollars		8,464	10,085	4,074	14,552	21,145	18,665	18,419
Cinnamon, foreign, exported	pounds		15,794	12,165	37,355	36,625	50,714	47,723	35,991
Value of ditto	dollars		10,321	7,028	15,390	14,788	21,255	16,456	9,535
Cochineal, imported	pounds					377,867	308,616	547,707	285,359
Value of ditto	dollars					294,419	249,057	440,707	221,332
Cochineal, foreign, exported	pounds					11,965	5,737	5,400	83,144
Value of ditto	dollars					12,073	4,779	5,847	79,109
Ginger, imported	pounds	2,572,916	2,693,958	2,044,980	1,411,029	1,390,738	1,113,346	1,517,829	1,278,589
Value of ditto	dollars	67,787	82,309	60,880	43,427	40,369	22,713	44,155	53,141
Ginger, foreign, exported	pounds	323,257	649,091	703,581	69,292	290,379	203,173	202,538	137,569
Value of ditto	dollars	12,007	20,836	66,911	3,767	11,432	10,655	10,884	7,708
Ginseng, domestic, exported	pounds	196,510	158,455	230,726	37,491	47,367	350,961	184,562	366,053
Value of ditto	dollars	100,549	102,073	133,813	17,339	19,796	175,705	58,331	193,736
Gum Arabic, Senegal, &c., imported	pounds					4,929,437	3,893,454	1,935,134	
Value of ditto	dollars					236,906	295,515	143,380	
Gum Arabic, Senegal, &c., foreign, exported	pounds					47,653	35,677	17,106	
Value of ditto	dollars					13,403	6,702	3,268	
Indigo, imported	pounds	1,003,284	1,387,847	1,965,789	2,079,397	1,392,796	1,732,290	1,533,037	1,647,767
Value of ditto	dollars	675,087	947,367	1,282,367	1,151,516	853,325	1,063,743	1,010,509	945,083
Indigo, foreign, exported	pounds	78,987	48,276	77,135	90,301	90,548	92,529	75,812	408,734
Value of ditto	dollars	79,498	38,987	90,276	92,627	53,790	70,866	62,178	390,050
Indigo, domestic, exported	pounds	2,740	1,079	36	1,509				
Value of ditto	dollars	2,803	910	36	1,320				

Synopsis of the principal agricultural products of foreign and domestic growth—Continued.

CLASSIFICATION.		1851.	1852.	1853.	1854.	1855.	1856.	1857.	1858.
Drugs, dyes, and condiments—Continued—									
Licorice, imported	pounds	....	....	....	....	3,466,312	3,359,523	4,956,449	5,107,441
Value of ditto	dollars	....	....	....	....	299,814	311,399	434,643	496,212
Lime, chloride of, imported	pounds	....	6,761,067	7,238,886	9,088,035	9,932,510	9,725,142	12,686,031	12,256,315
Value of ditto	dollars	....	165,840	161,668	231,755	241,636	210,877	330,895	387,101
Madder, imported	pounds	....	....	....	....	10,652,548	20,847,472	14,113,425	....
Value of ditto	dollars	....	....	....	....	851,979	1,671,805	1,375,472	721,786
Nutmegs, imported	pounds	392,432	629,001	182,094	327,222	506,845	594,818	450,440	759,402
Value of ditto	dollars	948,975	345,949	88,059	181,810	283,886	326,133	254,637	378,257
Nutmegs, foreign, exported	pounds	3,144	8,384	1,264	793	2,442	....	13,441	25,649
Value of ditto	dollars	2,177	5,670	1,085	871	1,713	....	8,441	13,894
Oak bark and other dye, domestic, exported, value of	dollars	356,477	160,154	118,894	95,863	99,168	121,030	322,754	300,885
Opium, imported	pounds	40,885	42,123	131,370	108,178	111,229	157,814	131,154	135,915
Value of ditto	dollars	94,815	128,696	346,643	270,627	407,683	485,846	463,452	447,534
Opium, foreign, exported	pounds	7,778	4,235	9,889	5,711	3,297	5,067	5,185	10,457
Value of ditto	dollars	19,284	14,195	31,369	20,674	16,800	19,870	20,128	43,549
Pepper, black, imported	pounds	5,500,601	5,390,489	3,685,620	6,066,865	3,470,229	6,737,809	4,948,698	11,037,411
Value of ditto	dollars	192,722	203,505	181,694	363,146	183,112	313,552	279,287	631,723
Pepper, black, foreign, exported	pounds	3,786,714	406,406	431,426	1,941,316	2,144,386	1,824,772	945,382	2,122,575
Value of ditto	dollars	245,847	31,974	39,177	172,784	185,149	166,918	102,382	200,588
Pepper, red or Cayenne, imported	pounds	78,069	59,344	979,391	161,566	187,197	118,741	42,698	112,654
Value of ditto	dollars	4,899	3,279	45,475	8,833	10,010	5,849	2,460	5,493
Peruvian bark, quilla, &c., imported	pounds	....	....	....	....	1,952,742	1,852,568	1,832,340	....
Value of ditto	dollars	....	....	....	....	411,197	402,925	386,252	813,184
Peruvian bark, quilla, &c., foreign, exported	pounds	....	....	....	....	13,261	9,000	43,305	....
Value of ditto	dollars	....	....	....	....	3,670	1,986	32,685	....
Pimento, or allspice, imported	pounds	1,163,374	2,818,434	2,339,054	2,523,875	2,931,386	4,906,028	3,480,842	3,491,834
Value of ditto	dollars	103,796	178,607	185,012	154,123	215,986	352,022	241,503	203,143
Pimento, or allspice, foreign, exported	pounds	779,625	1,277,017	799,374	1,410,343	1,157,233	2,313,518	1,771,090	1,396,079
Value of ditto	dollars	85,207	101,611	83,809	143,025	106,942	215,500	151,578	104,540
Quinine, sulphate of, imported	ounces	18,148	12,130	100,485	120,753	80,821	129,215	141,109	31,610
Value of ditto	dollars	48,4[illegible]	27,343	203,274	242,704	154,098	253,771	219,964	54,166
Quinine, sulphate of, foreign, exported	ounces	2,[illegible]	1,659	2,948	3,773	6,327	1,770	5,219	21,081
Value of ditto	dollars	6,714	4,555	5,361	8,952	13,748	4,035	10,223	31,854
Salt, imported	bushels	8,681,176	10,116,080	10,066,981	10,158,376	12,926,234	15,406,864	17,165,704	10,091,635
Value of ditto	dollars	1,047,890	1,112,137	1,059,432	1,310,935	1,718,980	1,991,065	2,032,583	1,194,990
Salt, foreign, exported	bushels	76,556	44,490	48,124	60,567	104,416	126,487	131,737	96,846
Value of ditto	dollars	22,590	9,745	17,855	10,960	26,393	36,784	41,218	22,778
Salt, domestic, exported	bushels	344,061	1,467,676	515,857	548,165	536,073	698,458	576,151	533,100
Value of ditto	dollars	61,424	89,316	119,729	159,026	156,879	311,495	190,699	162,650
Sal soda, imported	pounds	....	....	....	....	2,627,505	13,021,894	6,915,784	7,882,181
Value of ditto	dollars	....	....	....	....	31,014	143,938	86,483	123,083
Sal soda, foreign, exported	pounds	....	....	....	....	86,605	3,196	95,623	....
Value of ditto	dollars	....	....	....	....	1,885	193	5,099	....
Soda, ash, or barilla imported	pounds	40,129,566	27,071,319	50,580,996	47,418,944	51,043,766	54,026,727	57,710,912	57,609,402

Value of ditto	dollars	287,958	566,819	845,443	989,428	902,966	1,011,684	1,115,030	1,211,305
Soda, ash, or barilla, foreign, exported	pounds	43,129	90,760	73,190	49,036	128,243	560,254	250,930	460,796
Value of ditto	dollars	630	730	1,497	1,066	3,509	18,296	9,477	11,275
Soda, carbonate of, imported	pounds					7,427,569	12,296,400	13,033,975	11,794,663
Value of ditto	dollars					169,244	318,387	424,024	373,590
Soda, carbonate of, foreign, exported	pounds					12,500		6,600	12
Value of ditto	dollars					506		334	8
Wood, imported	pounds	43,693	41,816	102,039	32,306	5,585	29,719	56,097	37,010
Value of ditto	dollars	1,429	1,108	2,099	804	212	682	1,201	1,203
Earthy and metallic products—									
Bricks, lime, and cement, domestic, exported, value of	dollars	12,045	13,539	32,625	23,194	57,393	64,297	68,002	103,801
Burr stones, imported	number								
Value of ditto	dollars					67,754	86,979	111,211	65,423
Burr stones, foreign, exported	number								
Value of ditto	dollars					527	1,520	652	220
Coal, imported	tons	214,771	183,015	221,508	252,865	287,402	173,055	237,377	259,845
Value of ditto	dollars	479,783	406,841	420,010	593,543	933,067	604,187	772,663	772,925
Coal, foreign, exported	tons	311	370	499	2,066	1,869	1,037	935	566
Value of ditto	dollars	1,690	1,189	1,519	7,617	9,242	7,093	3,177	2,909
Coal, domestic, exported	tons	37,727	45,336	79,510	93,881	110,586	136,291	129,490	118,304
Value of ditto	dollars	164,977	188,903	316,003	443,501	637,006	677,490	616,861	558,014
Copper, pig, bar, and old, imported, value of	dollars	1,531,701	1,499,467	1,529,295	1,846,170	2,227,457	1,388,812	1,650,513	1,068,551
Copper, pig, bar, and old, foreign, exported, value of	dollars	109,498	3,960	72,929		213,062	86,841	384,330	508,437
Gold, bullion and specie, imported, value of	dollars	3,569,090	3,618,059	2,427,356	7,031,914	1,092,602	990,305	6,654,636	11,566,068
Gold, bullion and specie, foreign, exported, value of	dollars	4,760,333	2,636,142	1,894,323	2,407,690	1,151,797	852,698	5,154,301	7,586,568
Silver, bullion and specie, imported, value of	dollars	1,884,413	846,984	1,774,023	3,726,623	2,567,010	2,217,337	5,807,163	7,708,428
Silver, bullion and specie, foreign, exported, value of	dollars	6,635,839	2,600,156	2,044,017	727,040	1,138,128	744,506	3,904,269	2,630,343
Gold and silver, bullion and specie, domestic, exported, value of	dollars	18,069,580	37,437,837	23,548,535	38,062,570	53,957,418	44,148,279	60,078,352	42,407,246
Iron, pig, old and scrap, imported	pounds	159,444,240	223,016,192	377,127,648	401,156,224	155,862,208	30,110,606	134,299,456	89,905,440
Value of ditto	dollars	839,553	1,038,249	1,673,090	3,238,922	2,228,635	1,356,197	1,113,422	827,062
Iron, pig, old and scrap, foreign, exported	pounds	2,664	98,179	59,597	50,183	12,358	18,639	3,626	415
Value of ditto	dollars	1,993	50,165	126,307	163,338	13,365	21,808	4,189	714
Iron, pig, domestic, exported	pounds	786,240	235,200	1,928,000	5,015,360	1,518,384	1,762,656	6,231,686	1,223,712
Value of ditto	dollars					23,060	27,215	53,390	24,087
Iron and steel, manufactures of, all kinds, imported, value of	dollars	17,942,202	19,629,343	28,552,548	28,012,972	22,345,230	23,224,065	24,840,669	13,240,575
Iron and steel, manufactures of, all kinds, foreign, exported, value of	dollars	136,668	116,340	167,673	685,787	1,615,236	427,011	496,494	192,806
Iron, manufactures of, all kinds, domestic, exported, value of	dollars					3,730,412	4,133,793	4,541,610	4,705,787
Lead, pig, bar, sheet, and old, imported	pounds	43,470,210	37,544,588	43,174,147	47,714,140	56,745,247	55,294,256	47,947,698	41,230,019
Value of ditto	dollars	1,517,603	1,243,331	1,618,058	2,095,039	2,556,523	2,528,014	2,305,768	1,972,243
Lead, pig, bar, sheet, and old, foreign, exported	pounds	3,895,997	3,176,556	1,351,506	408,880	1,695,677	2,369,009	4,102,957	2,507,559
Value of ditto	dollars	153,750	131,356	60,657	26,334	90,638	139,155	217,705	111,464
Marble, imported, value of	dollars	104,609	157,602	176,290	162,049	232,385	177,967	201,978	167,631
Marble, foreign, exported, value of	dollars		1,114			914	175	1,070	700
Marble and stone, domestic, exported, value of	dollars	41,449	57,240	47,628	88,327	168,546	162,376	111,403	138,590
Slates of all kinds, imported, value of	dollars	151,490	156,453	109,352	83,742	126,372	86,248	96,176	85,775
Slates of all kinds, foreign, exported, value of	dollars	2,189	52	930	869	1,628	1,241	1,725	3,076
Spelter, imported, value of	dollars					252,673	527,024	447,612	212,823
Spelter, foreign, exported, value of	dollars					17,348		9,009	
Tin and its manufactures, imported, value of	dollars	3,971,047	3,256,466	5,502,078	4,822,736	4,142,414	5,683,528	5,866,096	3,895,960
Tin and its manufactures, foreign, exported, value of	dollars	71,393	27,630	10,512	50,006	34,892	27,687	53,605	34,916
Tin, manufactures of domestic, exported, value of	dollars	27,823	23,420	22,988	30,698	14,279	13,610	5,622	24,186

Synopsis of the principal agricultural products of foreign and domestic growth—Continued.

CLASSIFICATION.	1851.	1852.	1853.	1854.	1855.	1856.	1857.	1858.
Earthy and metallic products—Continued—								
Zinc and its manufactures, imported, value of .... dollars..	....	....	....	....	427,794	372,291	593,467	219,593
Zinc and its manufactures, foreign, exported .... dollars..	....	....	....	....	3,561	1,536	8,184	17,939
Fertilizers—								
Guano, imported .... tons..	23,153	50,054	38,034	175,849	173,961	56,746	80,418	75,197
Value of ditto .... dollars..	97,881	147,595	96,563	692,072	459,947	331,576	279,096	525,376
Guano, foreign, exported .... tons..	537	430	348	386	59,589	994	2,085	2,153
Value of ditto .... dollars..	13,759	22,395	7,358	16,361	2,836,030	24,171	50,460	78,112
Gypsum or plaster, unground, imported, value of .... dollars..	73,088	74,906	90,427	115,912	108,113	115,165	90,168	82,313
Flax and hemp and their manufactures—								
Flax, imported .... cwt..	21,171	28,234	13,553	23,201	28,961	15,394	22,231	....
Value of ditto .... dollars..	176,197	175,312	135,681	250,391	286,809	132,461	220,738	197,934
Hemp, imported .... cwt..	37,530	26,829	52,416	52,639	19,217	6,348	61,643	46,264
Value of ditto .... dollars..	223,984	164,584	329,122	378,246	112,763	57,676	423,533	331,307
Hemp, foreign, exported .... cwt..	1,348	96	230	2,945	4,767	7,510	1,438	9,089
Value of ditto .... dollars..	7,876	377	2,310	42,614	57,305	54,249	11,871	81,890
Hemp, domestic, exported .... cwt..	4,769	3,067	2,413	9,210	13,289	3,646	7,325	....
Value of ditto .... dollars..	29,114	18,649	18,195	93,699	121,320	28,598	46,907	47,875
Hemp, Manilla, sun, &c., imported .... cwt..	198,338	169,387	250,199	210,193	285,090	293,550	353,365	....
Value of ditto .... dollars..	503,709	942,422	1,591,791	1,528,329	2,045,653	1,945,044	2,353,891	....
Hemp, Manilla, sun, &c., foreign, exported .... cwt..	2,082	824	379	5,319	14,233	1,516	9,564	....
Value of ditto .... dollars..	8,688	9,584	4,572	56,679	198,136	12,256	86,182	....
Hemp, Sisal, coir, jute, &c., imported .... cwt..	38,379	40,948	25,373	87,357	93,306	78,170	111,763	....
Value of ditto .... dollars..	201,316	180,099	98,541	281,940	295,162	205,889	334,328	....
Hemp, Sisal, coir, jute, &c., foreign, exported .... cwt..	1,235	....	....	12,068	17,752	14,109	57,601	....
Value of ditto .... dollars..	3,158	....	....	119,661	81,265	57,074	309,012	....
Flaxseed, imported .... bushels..	12,041	885,007	867,580	1,111,721	1,102,545	1,696,294	2,730,359	....
Value of ditto .... dollars..	410,017	589,749	633,395	928,140	1,009,381	1,741,260	3,003,824	....
Flaxseed, foreign, exported .... bushels..	170	....	....	....	....	6,215	7,900	94
Value of ditto .... dollars..	130	....	....	....	....	6,954	6,738	40
Flaxseed, domestic, exported .... bushels..	9,185	31,304	3,932	2,757	5,808	10,415	350	....
Value of ditto .... dollars..	18,988	56,187	7,719	4,958	6,016	18,043	525	....
Flax, manufactures of, wholly or in part, except those painted, mixed with wool, and slippers and shoes, imported, value of .... dollars..	9,018,855	8,676,094	10,488,207	11,231,935	8,935,676	11,600,054	11,763,503	6,776,508
Flax, manufactures of, wholly or in part, except those painted, mixed with wool, and slippers and shoes, foreign, exported, value of .... dollars..	107,382	131,153	149,399	179,598	278,850	179,686	92,930	63,770
Hemp, manufactures of, all kinds, imported, value of .... dollars..	2,104,243	2,647,253	3,272,184	3,714,946	3,716,442	3,927,635	5,787,448	4,601,833
Hemp, manufactures of, all kinds, foreign, exported, value of .... dollars..	197,929	211,140	192,605	407,762	526,049	196,947	579,984	677,047
Hemp, manufactures of, all kinds, domestic, exported, value of .... dollars..	....	64,903	103,216	186,766	351,775	393,217	390,916	225,515
Rags of all kinds, imported .... pounds..	26,094,701	18,288,458	22,766,001	32,615,753	40,013,516	38,727,017	44,562,080	....
Value of ditto .... dollars..	903,747	626,799	962,837	1,010,443	1,225,151	1,239,168	1,448,125	971,126
Forests, products of—								
Ashes, pot and pearl, domestic, exported .... tons..	5,918	5,092	3,491	3,217	3,596	3,355	5,768	....
Value of ditto .... dollars..	649,091	507,673	334,321	322,788	448,409	429,428	696,367	564,744

Boards, planks, and scantling, domestic, exported	M feet..	100,604	100,695	78,599	197,154	144,718	196,330	209,105	217,881
Hewn timber, domestic, exported	tons..	13,379	94,409	45,564	41,964	52,377	34,960	68,265	419
Shingles, domestic, exported	thousand..	34,871	53,405	41,939	26,174	36,845	45,173	70,646	195,170
Staves and heading, domestic, exported	thousand..	33,006	29,106	28,693	34,594	89,454	73,311	65,579	87,186
Boards, planks, scantling, hewn timber, shingles, staves, heading, and other lumber, domestic, exported, value of	dollars..	2,348,621	2,674,577	2,578,141	5,122,854	5,593,967	5,056,443	7,594,612	7,532,421
Masts and spars, domestic, exported, value of	dollars..	70,095	95,459	129,628	130,522				
Other lumber, domestic, exported, value of	dollars..	205,190	123,522	123,743	165,178		803,684	638,406	1,940,425
Cork tree, bark of, unmanufactured, imported, value of	dollars..	19,309	20,675	13,798	29,032	17,328	9,130	17,692	13,932
Corks, imported, value of	dollars..	131,181	136,853	178,321	208,485	267,324	202,567	209,572	167,181
Cork, other manufactures of, imported, value of	dollars..	1,024	66	150	2,397				86
Corks, foreign, exported, value of	dollars..	1,433	1,022	576	1,367	2,839	1,249	405	644
India rubber, unmanufactured, imported, value of	dollars..					1,660,141	1,045,276	832,058	666,583
India rubber, shoes and slippers, imported	pair..	125,409	16,429	54,779	4,825				
Value of ditto	dollars..	23,161	3,706	12,901	1,319				
India rubber, shoes and slippers, foreign, exported	pair..	12,812		140	17,304				
Value of ditto	dollars..	3,658		100	21,454				
India rubber, manufactures of, except shoes, domestic, exported, value of	dollars..					722,338	665,602	312,387	197,448
Palm-leaf hats, domestic, exported, value of	dollars..					37,232	59,706	73,494	33,351
Rosin and turpentine, domestic, exported	barrels..	387,920	449,194	454,715	601,280	731,060	524,799	641,517	574,573
Spirits of turpentine, domestic, exported	gallons..	363,828	358,618	634,371	1,669,523	2,339,138	1,844,560	1,522,177	2,457,235
Tar and pitch, domestic, exported	barrels..	112,971	63,254	59,144	76,989	89,999	87,765	96,731	42,675
Tar, pitch, rosin, and turpentine, domestic, exported, value of	dollars..	1,063,842	1,209,173	1,406,488	2,066,306	2,049,456	1,457,553	1,753,182	1,564,889
Willow, osier, imported, value of	dollars..					45,459	36,554	41,773	35,141
Willow, manufactures of, imported	dollars..					132,658	125,608	175,484	112,725
Fruits and nuts—									
Almonds, imported	pounds..	2,854,804	1,564,703	4,721,250	2,187,934	3,716,251	5,113,897	2,845,594	2,210,941
Value of ditto	dollars..	233,305	120,700	304,954	190,259	250,316	334,589	209,605	213,145
Almonds, foreign, exported	pounds..	45,036	42,366	26,146	89,346	68,374	106,370	92,048	42,944
Value of ditto	dollars..	4,050	5,534	2,434	5,746	9,144	13,125	14,916	5,970
Apples, domestic, exported	barrels..	28,842	18,411	45,075	15,376	33,959	74,287	33,201	27,711
Value of ditto	dollars..	71,367	43,635	107,283	51,766	107,643	143,884	135,280	74,363
Coco-nuts, imported, value of	dollars..								42,656
Currants, imported	pounds..	3,249,418	4,758,008	1,039,435	174,513	1,626,070	1,468,261	2,488,912	3,965,721
Value of ditto	dollars..	133,870	143,343	40,893	15,325	94,389	127,089	151,418	342,869
Currants, foreign, exported	pounds..	234,592	299,219	710,695	219,118	49,963	22,364	56,348	862,404
Value of ditto	dollars..	11,831	14,144	40,319	23,995	4,214	4,177	6,629	79,258
Dates, imported	pounds..	458,178	1,101,766	1,128,753	717,935	1,124,257	1,271,949	1,493,251	1,914,572
Value of ditto	dollars..	4,393	13,974	14,792	9,301	17,671	21,399	17,048	31,567
Dates, foreign, exported	pounds..	8,721	6,461	12,136	18,232	11,690	18,879		8,257
Value of ditto	dollars..	396	378	571	1,034	707	1,069		705
Figs, imported	pounds..	3,448,799	2,909,077	3,931,640	2,389,126	2,850,529	4,692,793	4,932,791	4,989,603
Value of ditto	dollars..	135,559	91,043	124,713	118,823	111,63[illegible]	233,181	212,207	308,472
Figs, foreign, exported	pounds..	72,979	52,570	76,232	64,084	68,180	192,664	213,828	159,492
Value of ditto	dollars..	6,648	4,034	6,979	7,376	6,644	18,050	25,554	16,867
Fruits, green, except oranges, lemons, and limes, imported, value of	dollars..					114,431	117,829	151,587	
Fruits, preserved, imported, value of	dollars..					138,794	124,480	1[illegible]2,557	121,058
Oranges, lemons, and limes, imported, value of	dollars..					818,576	640,670	640,544	780,210
Oranges, lemons, and limes, foreign, exported, value of	dollars..					10,111	10,328	17,929	20,073
Prunes and plums, imported	pounds..	1,424,659	1,593,448	2,576,775	1,891,103	2,139,061	3,048,835	4,171,770	5,157,422
Value of ditto	dollars..	81,773	95,171	113,769	82,056	115,525	141,387	227,063	292,104

Synopsis of the principal agricultural products of foreign and domestic growth—Continued.

CLASSIFICATION.	1851.	1852.	1853.	1854.	1855.	1856.	1857.	1858.
Fruits and nuts—Continued—								
Prunes and plums, foreign, exported .... pounds..	12,979	10,777	11,652	6,117	19,031	16,807	10,903	54,291
Value of ditto .... dollars..	2,171	1,261	1,251	978	2,314	2,305	1,929	5,758
Raisins, imported .... pounds..	18,986,712	17,973,558	14,603,753	16,839,512	21,183,339	14,366,407	15,699,624	23,047,443
Value of ditto .... dollars..	879,591	923,628	896,034	958,877	1,064,243	864,219	937,460	1,441,471
Raisins, foreign, exported .... pounds..	689,104	1,099,393	550,773	945,832	1,069,634	507,067	399,157	562,180
Value of ditto .... dollars..	52,159	64,549	45,069	80,657	69,014	49,805	39,355	58,522
Nuts, not specified, imported .... pounds..	4,619,261	2,595,394	5,087,461	4,488,029	7,802,675	5,020,267	4,880,282	....
Value of ditto .... dollars..	198,296	77,113	144,861	149,880	243,027	157,801	183,144	236,907
Nuts, foreign, not specified, exported .... pounds..	493,097	137,521	90,236	146,350	262,795	148,815	251,527	....
Value of ditto .... dollars..	12,485	6,032	6,898	11,425	19,280	7,757	12,873	42,459
Hops, domestic, exported .... pounds..	110,360	238,008	245,647	260,026	4,021,816	1,018,515	924,538	458,889
Value of ditto .... dollars..	11,636	69,042	40,054	63,763	1,310,720	146,966	84,852	41,704
Ice, domestic, exported, value of .... dollars..	106,805	161,086	175,056	202,118	190,793	191,744	219,816	200,525
Oils, vegetable—								
Castor oil, imported .... gallons..	22,184	5,952	59,839	28,514	38,716	143,681	167,264	226,578
Value of ditto .... dollars..	15,047	5,019	32,104	14,095	25,425	96,371	102,502	143,458
Castor oil, foreign, exported .... gallons..	265	262	....	30	975	....	2,481	13,434
Value of ditto .... dollars..	290	278	....	35	1,044	....	2,922	12,784
Essential oils, imported, value of .... dollars..	....	....	....	....	117,250	119,438	146,872	231,736
Essential oils, foreign, exported, value of .... dollars..	....	....	....	....	8,614	4,478	18,633	83,161
Linseed oil, imported .... gallons..	2,818,344	1,583,019	1,912,523	1,456,611	1,243,035	1,712,906	1,465,865	282,842
Value of ditto .... dollars..	1,632,811	779,054	1,045,897	775,058	776,097	1,063,771	958,200	164,757
Linseed oil, foreign, exported .... gallons..	17,651	22,622	19,520	13,396	12,974	26,430	61,410	17,073
Value of ditto .... dollars..	13,354	14,785	12,875	12,065	11,155	21,795	38,745	13,429
Linseed oil, domestic, exported .... gallons..	20,193	18,073	18,266	32,622	56,692	62,469	58,114	65,398
Linseed oil and spirits of turpentine, domestic, exported, value of .... dollars..	145,410	152,837	362,960	1,184,329	1,186,732	896,238	795,490	1,137,507
Olive oil, imported .... gallons..	164,314	100,467	211,995	55,065	254,733	222,274	201,050	199,959
Value of ditto .... dollars..	106,889	41,058	139,770	48,013	404,800	470,519	421,424	309,787
Olive oil, foreign, exported .... gallons..	4,605	2,505	16,054	26,470	62,778	34,633	22,409	16,542
Value of ditto .... dollars..	3,576	2,320	17,229	22,281	55,030	41,636	44,601	17,748
Palm and coco-nut oil, imported .... gallons..	....	....	....	....	767,784	1,149,547	897,206	1,141,510
Value of ditto .... dollars..	....	....	....	....	295,211	416,317	337,881	405,681
Palm and coco-nut oil, foreign, exported .... gallons..	....	....	....	....	29,516	24,265	12,723	114,243
Value of ditto .... dollars..	....	....	....	....	21,225	24,388	7,930	56,446
Hemp and rapeseed oil, imported .... gallons..	2,644	11,110	245,023	50,979	17,215	53,429	17,215	26,989
Value of ditto .... dollars..	1,618	6,400	143,875	18,926	11,601	26,156	11,601	14,531
Oil cake, domestic, exported, value of .... dollars..	....	....	....	....	739,589	1,136,970	1,186,980	1,435,861
Potatoes—								
Common potatoes, imported .... bushels..	299,132	322,223	353,082	306,187	516,241	120,629	109,771	....
Value of ditto .... dollars..	94,441	119,388	92,870	118,747	222,314	71,218	87,572	97,160
Common potatoes, domestic, exported .... bushels..	106,342	148,916	600	140,575	245,469	247,536	260,424	242,231
Value of ditto .... dollars..	79,314	115,121	455	121,680	203,416	153,061	205,616	205,791
Seeds, trees, shrubs, and plants—								
Garden seeds, trees, shrubs, plants, &c., imported, value of .... dollars..	168,386	143,764	194,096	187,239	234,401	371,264	386,504	392,440

Garden seeds, trees, shrubs, plants, &c., foreign, exported, value of..dollars..	1,611	1,230	2,496	2,061	323	1,063	10	26
Spirits and wine—								
Brandy, imported..........gallons..	2,163,783	2,751,947	3,854,956	2,152,441	1,024,497	1,715,717	1,613,328	1,180,484
Value of ditto..........dollars..	2,126,679	1,792,988	3,251,408	2,255,397	1,479,302	2,859,342	2,327,262	2,232,452
Brandy, foreign, exported..........gallons..	86,476	48,484	51,116	84,913	61,619	43,015	73,767	98,838
Value of ditto..........dollars..	80,072	51,577	72,560	136,018	93,960	69,072	141,683	139,378
Cordials, imported..........gallons..	33,286	37,510	50,450	39,129	39,178	54,605	67,374	81,447
Value of ditto..........dollars..	34,127	34,099	45,251	41,298	53,186	81,463	92,396	104,269
Cordials, foreign, exported..........gallons..	2,494	2,824	547	1,259	735	4,566	2,022	3,017
Value of ditto..........dollars..	3,080	2,698	1,237	1,236	1,133	8,639	3,402	5,682
Spirits, except brandies and cordials, imported..........gallons..	1,291,731	1,224,278	1,406,943	1,596,817	1,588,214	2,353,730	2,431,532	2,803,383
Value of ditto..........dollars..	465,054	212,379	531,139	692,877	726,238	1,060,771	1,344,067	1,483,422
Spirits, foreign, except brandies and cordials, exported..........gallons..	42,857	75,930	98,254	157,466	151,518	201,414	78,468	113,430
Value of ditto..........dollars..	26,311	34,577	55,799	86,636	94,768	111,766	57,414	65,836
Spirits from grain, domestic, exported..........gallons..	95,245	136,347	360,633	780,056	742,961	897,348	2,167,924	1,000,997
Value of ditto..........dollars..	36,084	48,737	141,173	280,648	384,144	500,945	1,248,234	476,722
Spirits from molasses, domestic, exported..........gallons..	756,246	1,102,696	1,065,396	2,120,620	3,269,231	2,692,497	2,578,603	3,508,071
Value of ditto..........dollars..	339,622	323,949	329,381	809,965	1,448,280	1,329,[illegible]51	1,216,635	1,367,691
Wines, all kinds, imported..........gallons and dozen..	6,112,896	6,290,336	7,079,353	6,892,363	5,128,413	4,099,177	5,888,[illegible]1	4,352,159
Value of ditto..........dollars..	2,359,289	2,213,230	2,995,631	3,370,8[illegible]2	3,117,330	3,164,440	4,274,205	3,246,3[illegible]8
Wines, all kinds, foreign, exported..........gallons and dozen..	540,639	266,619	259,899	220,736	297,132	159,916	133,600	139,816
Value of ditto..........dollars..	253,019	147,970	157,424	202,190	260,932	167,910	149,815	172,764
Sugar, molasses, and syrup—								
Sugar, brown, imported..........pounds..	363,537,861	450,312,593	456,510,627	449,520,309	468,307,442	542,813,245	774,931,815	517,228,624
Value of ditto..........dollars..	12,882,274	14,430,734	14,639,766	13,406,976	14,418,887	23,400,353	42,614,604	23,317,435
Sugar, white, clayed, or powdered, imported..........pounds..	4,786,437	6,461,540	7,018,952	5,658,686	5,241,272	1,143,410	1,218,184	1,755,916
Value of ditto..........dollars..	235,732	239,032	294,700	254,308	241,[illegible]69	61,504	86,820	109,887
Sugar, loaf and other refined, imported..........pounds..	12,077,726	736,958	871,105	698,858	207,990	1,221,201	718,843	11,158
Value of ditto..........dollars..	723,420	43,081	53,310	39,505	13,091	68,109	68,906	1,001
Sugar candy, imported..........pounds..	21,280	33,451	24,995	35,867	74,371	36,324	18,853	40,578
Value of ditto..........dollars..	4,468	5,511	5,172	3,721	8,9[illegible]9	4,239	1,887	2,205
Sugar, brown, foreign, exported..........pounds..	3,795,625	8,060,309	18,073,933	49,820,419	29,660,189	20,929,675	12,168,659	71,674,178
Value of ditto..........dollars..	187,651	697,180	759,240	1,942,310	1,104,174	1,030,617	884,593	4,235,175
Sugar, white, clayed, or powdered, foreign, exported..........pounds..	1,484,188	754,256	841,070	1,357,708	589,732	299,233	456,712	260
Value of ditto..........dollars..	103,229	46,396	55,486	86,433	42,778	23,165	46,017	32
Sugar, loaf and other refined, foreign, exported..........pounds..	1,107,295	758,792	66,698	825,862	3,465,152	2,111,[illegible]	2,106,430	2,766,276
Value of ditto..........dollars..	71,837	50,073	4,613	67,300	253,528	189,601	249,652	232,119
Sugar, brown, domestic, exported..........pounds..	561,822	401,620	672,274	15,595	4,062,625	5,170,819	2,196,412	5,410,225
Value of ditto..........dollars..	29,170	24,157	33,854	1,279	286,408	404,145	190,012	375,062
Sugar, refined, domestic, exported..........pounds..	2,669,541	2,096,770	5,155,057	4,789,411	7,098,320	4,100,372	3,141,835	1,790,805
Value of ditto..........dollars..	219,588	149,921	375,780	370,488	586,463	360,444	358,206	200,724
Molasses imported..........gallons..	36,376,772	32,795,610	31,886,100	27,759,463	26,365,593	23,617,674	32,705,844	24,566,257
Value of ditto..........dollars..	3,707,581	3,595,127	3,654,888	3,126,293	3,502,370	4,334,668	8,259,175	4,116,759
Cane syrup, imported..........pounds..	255	2	1,622	50,732	53,143	48,574	115,120	264,689
Value of ditto..........dollars..	45	1	55	1,992	2,798	4,448	4,284	6,185
Molasses, foreign, exported..........gallons..	226,592	325,958	488,606	889,295	1,517,474	1,261,140	1,441,660	3,908,075
Value of ditto..........dollars..	44,258	60,850	97,880	179,731	311,864	306,180	510,214	1,125,433
Molasses, domestic, exported, value of..........dollars..	16,830	13,163	17,582	130,924	189,830	154,630	108,003	115,893
Tea—								
Tea, imported..........pounds..	17,461,114	29,437,306	22,721,745	24,417,712	25,333,097	22,889,850	20,367,824	32,995,021
Value of ditto..........dollars..	4,798,005	7,285,817	8,224,853	6,739,447	6,973,999	6,933,214	5,775,175	7,261,815
Tea, foreign, exported..........pounds..	3,956,340	3,849,538	3,429,861	5,181,599	5,569,504	4,708,380	3,867,539	4,228,444
Value of ditto..........dollars..	1,345,504	1,358,674	1,200,327	1,795,894	2,036,389	1,682,611	1,430,212	1,384,428

Synopsis of the principal agricultural products of foreign and domestic growth—Continued.

CLASSIFICATION.	1851.	1852.	1853.	1854.	1855.	1856.	1857.	1858.
Tobacco and its manufactures—								
Tobacco, imported .... pounds..	4,029,921	3,570,685	5,008,872	5,362,613	4,363,104	6,844,052	8,574,632	7,499,566
Value of ditto .... dollars..	555,608	587,395	855,803	794,896	614,076	1,009,044	1,358,835	1,255,831
Cigars, imported .... thousand..	218,792	319,197	262,387	353,518	376,019	315,959	560,043	459,941
Value of ditto .... dollars..	2,550,812	2,985,10	3,311,955	3,384,036	3,438,997	3,741,460	4,221,096	4,123,108
Snuff, imported .... pounds..	1,498	4,709	10,865	10,914	22,359	20,303	13,933	21,713
Value of ditto .... dollars..	353	853	2,553	2,780	4,729	4,078	2,624	5,153
Other manufactures of tobacco, imported .... pounds..	42,249	29,015	31,217	81,945	139,950	302,907	156,579	223,791
Value of ditto .... dollars..	12,550	5,469	4,947	11,236	21,867	35,962	18,898	22,898
Tobacco, foreign, exported .... pounds..	275,218	933,578	501,447	677,009	131,279	129,190	77,763	1,702,622
Value of ditto .... dollars..	50,545	161,590	84,364	95,932	14,116	22,215	14,287	411,588
Cigars, foreign, exported .... thousand..	8,445	10,329	12,499	8,385	14,331	11,275	11,168	8,709
Value of ditto .... dollars..	167,309	191,889	226,067	151,673	192,373	180,742	227,143	166,002
Snuff, foreign, exported .... pounds..	8	....	....	7,755	585	3,481	1,290	153
Value of ditto .... dollars..	8	....	....	1,556	120	828	356	29
Other manufactures of tobacco, foreign, exported .... pounds..	211	....	1,683	473,198	1,065,681	533,687	1,250,161	74,026
Value of ditto .... dollars..	211	....	282	47,237	111,943	93,781	241,325	11,818
Tobacco, domestic, exported .... hogsheads, cases, and bales..	95,945	137,097	159,853	126,107	176,492	144,118	176,911	145,151
Value of ditto .... dollars..	9,219,251	10,031,283	11,319,319	10,016,046	14,712,468	12,221,843	20,260,772	17,009,767
Snuff, domestic, exported .... pounds..	37,422	58,475	39,641	36,267	72,534	86,055	50,401	37,215
Tobacco, manufactured, domestic, exported .... pounds..	7,235,358	8,436,153	10,561,692	10,273,152	9,624,282	10,004,606	7,455,666	11,210,574
Snuff and tobacco, manufactured, domestic, exported, value of .... dollars..	1,143,547	1,317,622	1,671,500	1,550,327	1,500,113	1,829,207	1,458,553	2,410,224

ANIMALS.

SHEEP-REARING IN CALIFORNIA.

BY ANDREW W. M'KEE, OF SAN FRANCISCO.

The rearing of sheep in the State of California has been perfectly tested. In no part of the world do they thrive better, and soon wool will be exported in large quantities. With a climate kindred to that of Asia Minor, Greece, Italy, Southern France, and Spain, whence originated the Merino—also comparatively free from dampness, and entirely so from thunder-storms, it can be easily seen that sheep here are liable to fewer diseases, and multiply more rapidly than on any portion of the globe, having lambs twice a year, and often twins, whilst our mountains and valleys furnish them with almost inexhaustible pasturage the year round. The latter fact shows that the expense of raising wool (saying nothing of the first cost of the sheep) is not over one-tenth of that in the New England States.

The number of sheep in this State, by the late Census, is 650,000. Wool of a fine quality is produced in Australia, whence are sent to England 40,000,000 pounds annually. The business was only commenced there about forty-five years ago, and is now second to no other. The market for her wool is by a transportation of more than half the circuit of the globe. But in California, the shipment of this article can be made from San Francisco to New York at no greater cost than would be by a land carriage of 100 miles. It can be satisfactorily shown that the State has the capability of growing 100,000,000 pounds of wool annually, and then leave 20,000,000 acres of land to the plough. In the palmy days of the old Mission of San Gabriel, the "Fathers" possessed 100,000 sheep, which were mainly taken care of by the Indians. The amount of land in California suitable for agricultural purposes is estimated at 76,622,000 acres—46,622,000 acres for tillage, and 30,000,000 for stock and grazing.

DOMESTICATION OF THE ELK.

The elk inhabits marshy forests and the banks of rivers or lakes of the northern portions of Europe, Asia, and America; but owing to the eagerness with which it is hunted, it is constantly becoming more rare. Having already abandoned many of its former haunts, the period of its extinction is probably not far distant, unless seasonable means are employed for its preservation. It has generally been

considered by naturalists that the European elk *(Cervus alces)* and the American elk *(Alces americanus)* are specifically identical. It is probable, however, that they are distinct.

The males of the European species, which are much larger than the other sex, frequently attain a height of 7 and even 8 feet, but do not acquire full growth until the fourteenth year; at least so it is to be presumed, as up to that period his horns, which are of a flat form, are annually provided with an additional branch. A young elk, two years old, sometimes measures upwards of 6 feet at the shoulder. His horns are perceptible at nine months after birth. For the first year, they are cylindrical and short; the second year, they are about a foot in length, but not branched; the third year, two points are discernible; the fourth year, three; and the fifth year, they acquire their full length. From that time forward, they yearly increase in breadth and in the number of branches, until there are as many as fourteen on each horn. He generally sheds his horns in the month of February in each year. The female elk has no horns.

The males of the American species are also larger than the females, being nearly 6 feet in height, when full grown; and they have often been known to weigh 700 pounds. The horns, which are shed in the spring, are wide-spreading, palmated, very thick and strong towards the base, and in old individuals, weigh from 50 to 60 pounds. The head is of great length in proportion to that of the neck; the nose black and protruded; the eyes large, below which there is a slit, nearly an inch in length, through which this animal has been erroneously supposed to breathe and smell, when hard run, or when the muzzle is under water while drinking, as this aperture has no communication with the nose; the legs are long and the tail very short. The coarse, long, and hairy fur becomes quite thick on the approach of winter; but varies somewhat with the age from a blackish brown to a greyish color, or pale dun.

The European elk is naturally timorous, and usually flies at the sight of man. At certain seasons, however, like other animals of the deer kind, he is considered dangerous. He strikes with his horns and hoofs, particularly the latter, so forcibly as to kill a wolf or other large animal at a single blow. When incensed, it is stated that the hair on his back bristles up like the mane of a lion, which gives him a wild and frightful appearance. His usual pace is a high shambling trot, with somewhat extended strides, but when frightened, he increases his speed to a tremendous gallop. In passing through thick woods, he carries his horns horizontally to prevent them from being entangled. In summer, he resorts to morasses and low situations; for, like others of his congeners, he frequently takes to the water in warm weather, being an admirable swimmer. In winter, he retires to the more sheltered parts of the forest, where willow, ash, &c., are to be found, as from the small boughs of these trees he obtains his sustenance during that period of the year. In summer and autumn, the elks are often to be met with in small herds, but in winter, they seldom occur in companies of more than two or three; indeed, at the latter season it is frequently seen alone.

The American elk, like the European, is somewhat migratory, moving to a considerable distance from its summer haunts on the approach of winter. Although ten or more may frequently be seen herding together, it is not strictly gregarious. In the dreary and desolate regions towards the Arctic Circle, it is seldom that more than a couple of these shy and solitary animals are seen together. They feed upon the hemlock-spruce, cedar, fir, or pine, moose-maple, birch, willow, and other trees. They frequently repair to salt springs, or "deer licks," not only to eat the saline herbage growing in their neighborhood, but to lick the wet stones, or pebbles, imbued with salt. The senses of hearing and smelling of these animals being highly acute, they soon detect the approach of the hunter, and when frightened, start off at great speed; but when at bay, and all escape is hopeless, they stand ready to dash at and demolish their pursuer, and crush the dogs beneath their feet.

The female of the American elk usually produces two young at a birth, generally each year about the end of April, after a pregnancy of nine months. She engenders at the age of four years. The proportion of males is larger than that of the females.

The flesh, or venison, of the elk, whether fresh or dried, is excellent, and tastes like beef; that of the young particularly delicious. The tongue and nose are regarded as great delicacies both in Scandinavia and America. The skin of the European species is applicable to many valuable purposes; for instance, as is recorded, a regiment clothed with waistcoats made from its hides, from their thickness, were nearly proof against ball. The flesh of the American elk is also eaten, and the skins are used for clothing, as well as for covering the wigwams of the red man, and for constructing canoes.

The elks of both continents are easily domesticated. Formerly it was employed in Sweden to draw sledges; but owing to their speed, frequently accelerating the escape of criminals, the use of them was prohibited. In America, however, many attempts have been made to break the elk into harness, but seemingly without success.

Among those who have been particularly successful in the domestication of the elk in the United States, may be mentioned the late Colonel John Mercer, of Cedar Park, West River, Cumberland county, Maryland; Colonel Joseph Tuley, of Millwood, Clarke county, Virginia; Mr. Clarke Mills, the sculptor, near Washington city; and Mr. Lorenzo Stratton, of Little Valley, Cattaraugus county, New York. Colonel Tuley has been engaged in rearing these animals, as well as the fallow deer of Europe, for upwards of twenty years. He obtained his stock—one buck and two does—from Colonel Mercer, and now has 12 ranging his parks, with 64 fallow deer. The original supply of Colonel Mercer was brought from St. Louis by water to Wheeling, Virginia; thence to Cumberland on foot.

The late experiments, however, of Mr. Stratton, as will be seen from the following extract of a letter dated January 12, 1859, would seem to place the ultimate success of the profitable domestication of the elk beyond a doubt: "The American elk, with all its claims to attention, is fast disappearing from the earth, with scarcely an effort

for its preservation or domestication. By *domestication*, I do not mean simply *taming*, but a course of intelligent breeding and protection. A series of experiments with this animal, for the last six years, has furnished me with sufficient evidence to say confidently that this business may be made of great importance to the country. Some years since, in the course of trade, I came in possession of a pair of elk fawns. To me, these beautiful animals had an additional interest from the fact that they were the remnant of a race which had once roamed the hills in countless numbers, where grew spontaneously everything necessary for their subsistence. My desire to keep and breed them, without their becoming a tax upon me, led to diligent inquiry in relation to what had been done in the way of their domestication. I procured, as far as possible, every paper, book, and document which could give any light upon the subject. I wrote to every part of the country whence any information could be obtained, and opened a correspondence with those who had undertaken such an enterprise. The result of my efforts was simply this: Nearly every one who had owned an elk was a gentleman amateur, and had left the care and direction to servants; that the bucks, not having been castrated at the proper age, had become unmanageable; and when the novelty of the attempt was over, the domestication in most cases was abandoned. But from my own inquiries, and a close personal observation of the habits of the animal, I believed that a different course would produce a more favorable result. The first requisite was a place to keep them in. Now, they had always lived in the woods, summer and winter—Why not live in the forests again? Acting on this principle, I immediately set to work and fenced in about 150 acres of hill land, which was steep and stony, covered with brush-wood and entirely useless for agricultural purposes. In this lot, I turned my elks, where they have been six years. In the meantime, I purchased two more does, and have reared eight fawns. Having emasculated the older bucks as fast as the younger ones became adult, I have now a herd so gentle that a visitor at my farm would hardly imagine that their ancestors, only three generations back, were wild animals. And this has been done simply by visiting the park two or three times a week, and always carrying them an ear of corn, some little delicacy, or salt, and treating them with unvarying kindness.

"The facility for extending this business may easily be conceived. New York, alone, might support 100,000 elks on land where our domestic cattle could not subsist; furnishing an amount of venison almost incredible; while the adjoining State of Pennsylvania, to say nothing of others, might sustain a still larger number without encroaching upon an acre of land now used for stock rearing, or any other purpose connected with agriculture.

"What has been said of the elk might apply to the moose in parts of the north, as Maine, New Hampshire, and Vermont, and to the buffalo in other sections."

In connection with this subject may be mentioned the successful introduction of the Canna, Eland. or Elk, (*Antilope oreas*,) of the Dutch

colonies of the Cape of Good Hope, into England by the late Earl of Derby. This animal is one of the largest of its genus, standing higher and equalling an ox in size, yielding a meat equally fine in texture, with a more marked, delicate, and distinctive flavor. This animal would form an appropriate subject for a future report.

D. J. B.

PROPOSED INTRODUCTION OF THE YAK-OX FROM TARTARY TO THE GREAT PLAINS OF THE WEST.

Of the benefits resulting from the introduction of a useful animal into a country in which it did not before exist, argument is unnecessary; but the gift of cattle to a people who, though yet uncivilized, are capable of appreciating their value, is to commence a revolution in their condition immeasurably for the better; for the possession of property is a strong bond of society, and the desire of acquiring it a great stimulus to industry. By the introduction of the Yak (*Bos grunniens*,) and its presentation to the chiefs of our Indian tribes existing on the borders of the Great Plains lying east of the Rocky Mountains, the condition of these people would certainly be ameliorated. If, as is probable, this animal should prove adapted to these regions, it could be reared in vast numbers, thereby adding to the wealth and comfort of the inhabitants, in supplying them with a new source of food, clothing, and other articles of use, which would involve care and attention and a state of peace and friendship; agriculture and commerce would follow, and prepare the way for the arts of civilized life.

An interesting and circumstantial account of this curious species of ox is condensed from the pen of Lieutenant Samuel Turner, of the British army, published in full in the 4th volume of the "Asiatic Researches."

The Yak of Tartary, called *Goora-Goy*, in Hindoostan, is about the height of an English bull, which, in many respects, he resembles. There appears to be no essential difference, except that the Yak is nearly covered with a thick coat of long hair. His head is rather short, crowned with two smooth, round horns, which, tapering from their insertion, arching inward, terminate in sharp points turned a little backward at the extremities; the ears are small; the forehead prominent, being adorned with much curly hair, and the eyes large and full; the nose is smooth and convex, with the nostril small; the neck short, describing a curvature nearly equal both above and below. Over the shoulders rises a bunch, which, at first sight, would seem to be the same kind of exuberance peculiar to the cattle of Hindoostan, but in reality consists only in the superior length of the hair, which, as well as that along the ridge of the back to the insertion of the tail, grows long and erect, but not harsh. The tail is composed of a prodigious quantity of long, flowing, glossy hair, descending to the hock, and is so extremely well furnished that not a joint of it is per-

ceptible; but it has much the appearance of a large hairy appendage artificially set on. The shoulders, rump, and upper part of the body are clothed with a kind of thick, soft wool, but the inferior parts with straight pendant hair, which descends below the knees; and in animals in high health and condition, it is sometimes so long as to trail on the ground. From the breast, there also issues a large, pointed tuft of hair, growing somewhat more profusely than the rest. The rump is rather low and the legs very short. In other respects, the hoofs, dew-claws, &c., this animal resembles the ordinary bull. There is a great variety of colors among the species, but black and white are the most prevalent. It is not uncommon, however, to see the long hair upon the ridge of the back, the tail, the tuft upon the breast, and the legs below the knees, white, when all the rest of the animal is jet-black.

These cattle, though not large-boned, from the profuse quantity of hair with which they are provided, appear of greater dimensions than they really are. They have a down, heavy look, but are not generally fierce, though they sometimes manifest formidable symptoms of impatience at the approach of strangers, stamping their feet, whisking their tails aloft, and tossing their heads. When excited, they are not easily appeased, and are exceedingly tenacious of injury, showing great animosity when any one has chanced to provoke them. They do not low loud, like our cattle, as is the case with their congeners of Hindoostan, but make a low grunting noise scarcely audible, and that but seldom, when under some impression of uneasiness.

The Yak, like the European bison (*Bos bison*,) and the American buffalo (*Bos americanus*,) has fourteen pairs of ribs. The period of gestation in the female, called *Dhe*, is not recorded. Several attempts have been made to procure a cross between him and the common cow, but without success. He invariably refused to associate with ordinary cattle, and exhibited a decided antipathy to them.

The Yak is pastured in the hottest part of Thibet upon short herbage, peculiar to the tops of mountains and bleak plains. The chain of lofty mountains situated between latitude 27° and 28° north, dividing Thibet from Bootan, the summits of which are generally covered with snow, is its favorite haunt. In these regions, the southern glens afford it food and shelter during the severity of winter; but in milder seasons, the northern aspect is more congenial to its nature, and admits of a wider range. These animals constitute a valuable property to the Tartar tribes, who live in tents, and accompany them from place to place, affording their herdsmen subsistence, a good covering, and a convenient mode of conveyance. Although they are useful as beasts of burden, being strong, sure-footed, and capable of carrying great weights, they are never employed in agriculture; yet the best requital with which the care of their keepers is rewarded is the abundant quantity of rich milk they give, yielding most excellent butter, which they have the custom of depositing in bladders or skins, excluding it from the air, where it keeps in this cold climate during the year. When a sufficient stock is accumulated, they load their cattle, and drive them to a proper market with their

own produce, which constitutes to the utmost confines of Tartary a most material article of commerce.

The herdsmen convert the hides into caps, jackets, and loose outer garments, the latter covering the whole of their bodies, hanging down quite to the knees, and afford sufficient protection against the lowest temperature of the desolate regions they inhabit—furnishing them at once cloaks by day and beds at night. The soft fur from the hump and shoulders is manufactured into a fine but strong cloth; and, if submitted to the test of European or American skill, might, no doubt, be made to produce a superior fabric. Tents and ropes are also manufactured from the hair. Their tails are esteemed throughout the East, as far as luxury or parade have any influence on the manners of the people; and in India are found, under the denomination of *Chowries*, in the hands of the meanest grooms, as well as occasionally in those of the first ministers of State.

D. J. B.

THE QUADRUPEDS OF ILLINOIS INJURIOUS AND BENEFICIAL TO THE FARMER.

BY ROBERT KENNICOTT, OF WEST NORTHFIELD.

FISHER.

Mustela Pennantii, **Erxleben.**

Description.—Length from nose to tail, 24 inches; tail to end of vertebræ, 14; tail to end of hairs, 17½. Specimens vary somewhat in size, but the head and body are usually over 2 feet in length, with the vertebræ of the tail more than half as long. The color is dark brown or black, darkest beneath, with some greyish intermixed, which becomes most prominent on the fore part of the back and head.

The fisher is much larger than the true weasels, (Putorius,) and, like the marten, differs considerably from them in organization and habits; a remarkable difference being in the arboreal habits of the species of Mustela, which have sharp, curved claws, enabling them readily to climb trees. The celebrated sable of Northern Europe and Asia belongs to this genus. From its long head, bushy tail, and large size, the fisher, in general appearance, resembles a fox more than a weasel; and, indeed, is sometimes called the "black fox," or the "black cat," and, in New England and the North, the "pekan." But the name of fisher is the only one by which it is known in Illinois and the Northwestern States. The origin of this inappropriate designation is obscure; the animal is not sufficiently aquatic to merit it.

The fisher exists in wooded regions throughout the northern parts of the United States, from the Atlantic to the Pacific, and even to Arctic America. It has been found, within a few years, in Northern Illinois, and appears to be an inhabitant of the woods, alone. It

neither burrows, nor lives habitually in the burrows of other animals; but chooses its retreat in the cavity of a standing tree. Almost as arboreal as the squirrel, it not only climbs trees and leaps from bough to bough, but pursues its prey among the branches, capturing even the nimble grey-squirrel. The leaps of the fisher are often astonishing, as it has been known to spring to the ground from a height of 40 feet.

Being much swifter of foot than the mink, it frequently captures its prey by open chase, instead of always coming upon it by stealth, in the manner of that species. It preys upon squirrels, and has been observed to capture raccoons and even the pine marten. It feeds largely upon mice, and probably upon hares and grouse. It is said to eat frogs, and doubtless devours other reptiles. Its favorite prey in the North has been stated to be the porcupine, which it kills by biting in the belly. This, though doubted by some naturalists, may very likely be the case, as I am well informed that dogs accustomed to hunting porcupines, will, by persistently teazing them for a long time, finally succeed in turning them on their backs, and killing them without being injured from their spines, which afford no protection to the belly.

It has not been shown satisfactorily that this animal catches fish, as its common name would indicate, nor even that it is at any time particularly fond of seeking its food about water. It certainly does not resort to the water so much as the raccoon, which at least feeds largely upon some aquatic animals. The fisher has been said to follow the trappers, like the wolverine, to pull down their deadfalls, and to eat the baits, without being caught itself. In the fur countries, it is captured in deadfalls, or, frequently, is shot.

This species produces from two to four young each season, which are always found in holes in standing trees. Like all carnivorous mammals, the fisher is chiefly nocturnal, though it has sometimes been seen hunting by day. Decidedly nocturnal animals are often observed to move about by daylight, in spring, when providing for their young; and hence the raccoon, opossum, and hare are met by day in spring and early summer, though never in autumn and winter.

AMERICAN PINE MARTEN, OR AMERICAN SABLE.

***Mustela americana*, Turton**

Description.—Length from nose to tail, 17 inches: tail to end of vertebræ, 6¾; tail to end of hairs, 10½. Specimens vary from 14 to 22 inches in length, the vertebræ of the tail being about one-third the length of the head and body. The general color is reddish yellow, clouded with black; becoming lighter on the back towards the head, which is still lighter and sometimes white. The legs and tail are blackish. There is a large patch of yellow on the throat, extending to the legs.

By some writers, this species has been considered identical with the European marten, *(Mustela martes,)* and is so described by Audubon and Bachman, Dekay, and others. But, upon careful comparison, it

has been shown to be decidedly distinct; and an eminent Russian zoölogist states that it more nearly resembles the famed Siberian sable than any other animal. The fur is finer than that of the mink, and by some is considered handsomer, even in light varieties of color; while good dark-colored skins are scarcely, if at all, inferior to the costly sable. In fact, many American pine marten skins, dyed black, are sold and worn as Siberian sable. The fur, like that of the mink, has grown recently more valuáble, in consequence of the increased demand of fashion. It has, however, always been of considerable value in commerce, being dyed to imitate more expensive furs. Richardson writes, in the year 1829, that upwards of one hundred thousand skins had long been collected annually in the fur countries. I observed, last year, that great numbers are still bought by the American and English fur-traders on the Red River of the North, and many are procured in the northern parts of the United States.

The marten is found in the wooded districts of the northern parts of our Union; and beyond to the Arctic regions, throughout the continent, its range being nearly the same as that of the fisher, like which it is never found away from the forests. It has been seen, occasionally, in Northern Illinois. It was abundant, formerly, in Western New York, and is still common in the northern division of that State, particularly in the unsettled mountainous regions.

Though the marten is generally considered arboreal, it has been said sometimes to dig burrows. Hunters who have trapped them extensively in Western New York inform me that the retreat of the martens is usually in standing hollow trees, and that, in winter, they may frequently be discovered sitting with their heads out of the holes. As, if shot in this position, they would fall back and be lost, advantage is taken of their inquisitiveness, by walking slowly around the tree, and inducing the animal to draw its body entirely out of the hole, in order to keep the object of its curiosity in view. When quite out, a well-directed shot brings it to the ground.

The marten prefers the densest woods in mountainous districts, and exhibits no liking for water. It is said that in the far North it preys on mice, hares, and grouse, and in summer on small birds, eggs, &c., and that it does not reject carrion. Like the fisher, it is often troublesome in winter by destroying the hoards of meat and fish laid up by the natives, whenever a crevice is accidentally left by which it can enter. It is stated that it also feeds upon insects and reptiles, and, like the bear, is fond of honey. It is also affirmed that it has been known to eat nuts and berries; but there is doubt, at least, if it ever subsists habitually on any other than animal food. It feeds much upon squirrels, which it pursues and captures on the trees, following them into their holes; and I am informed that it sometimes makes great havoc among them; but the little red-squirrel generally escapes by its greater celerity in climbing. The marten is courageous, fighting savagely, and even beating off dogs. When brought to bay, it shows its teeth, sets up its hair, arches its back, and makes a hissing noise, like a cat. The farm-yard seems to offer it no attractions, as a residence, nor will it even make marauding

expeditions to the poultry house. On the settlement of its native forests, the marten rapidly disappears; and hunters inform me that it is never found living near a "clearing" in the woods, though the dwelling of man may yet be distant. It is prolific, producing from four to eight young annually.

SMALL BROWN WEASEL.

Putorius Cicognanii, BAIRD.

Putorius fuscus, AUDUBON AND BACHMAN.

DESCRIPTION.—Length from nose to tail about 8 inches; vertebræ of tail one-third the length of head and body: tail, with hairs, nearly three-sevenths; black of the tail, two-fifths its length: the outstretched hind feet reach the end of the vertebræ. In summer, rather dark brown above, deepest along the vertebral line, whitish beneath; edge of upper lip white. In winter, white; tail with black tip. The tail begins to darken at about one-third its length from the base above, and two-thirds below; on the terminal third it is entirely black, the hairs forming a dense pencil of this color. The species is readily distinguished from the other American weasels by the small size and the tail, which, with the hairs, is rather less than half the body alone. *Putorius pusillus*, nearest to it in size, has a considerably shorter tail, with the tip only slightly dusky, not black. *Putorius noveboracensis* differs strikingly from this in its proportionally longer tail and less extent of the black tip; the vertebræ of the tail being about half as long as the body and head.

Specimens of the small brown weasel are in the Smithsonian Institution, from Labrador, Puget Sound, Massachusetts, the Red River of the North, and Northern Illinois. I obtained several on the Red River of the North, where they appear to be abundant. I have seen several in Northern Illinois, where they are not uncommon. This is the same species as that described by Audubon and Bachman under the name of *Putorius fuscus*, which they found in various parts of New York. Whether the Putorius noveboracensis inhabits the prairies or not, this weasel certainly does, as observed in Northern Illinois and on the Red River of the North; but at how great a distance it may exist from the woods, I cannot determine, nor do I know that it prefers the prairie; probably it does not, however, though the specimens taken were found in the prairie or prairie groves. The wooded regions of Massachusetts produce these animals in abundance.

This weasel is no less courageous and bloodthirsty than the Putorius noveboracensis. One of the specimens from Illinois, mentioned above, destroyed nearly fifty chickens, several of which were adults and many half grown, in a single night and the early part of the following evening; and it was so bold as to kill several young chickens in a coop beside which a man was standing, watching for it. I finally shot it while it was running near me in pursuit of a chicken, though a few minutes before we had chased it into a retreat under a haystack. This extreme boldness could not have been the result of hunger, as it had already, during the same evening, killed a large number of fowls. In its general habits, this species is thought very nearly to resemble the common white weasel.

LESSER WEASEL.

Putorius pusillus, AUDUBON AND BACHMAN.

DESCRIPTION.—This is the smallest of the American weasels. Length, about 6 inches from nose to root of tail; vertebræ of tail, one-fifth to one-sixth the length of head and body; the terminal hairs of the tail about one-third the length of the vertebræ, which do not exceed 2 inches; tail slender, not tufted at the tip; above, almost liver-brown: beneath, white; no distinct black tip to the tail, though this is sometimes darkest.

This species is said to become white in winter, in the fur countries. It is supposed to remain brown throughout the year, within the limits of the United States. There can be no difficulty in distinguishing it from all others, not only by its dimensions, but by the very short tail, which is destitute of the black-tip characteristic of the rest, although the extremity is sometimes dusky. Even more widely distributed than the common white weasel, this animal has been found from New York to Puget Sound. Its northern and southern limits are not yet determined. It has been found in Indiana and Northern Illinois. Of its habits, I can state nothing from observation, though they are doubtless similar to those of our other weasels; yet, from this animal's smaller size, it may be supposed to be less destructive to poultry, and to feed more largely upon insects.

WOLVERINE, OR GLUTTON.

Gulo luscus, SABINE.

DESCRIPTION.—The length from nose to tail is about 2½ feet, and the tail, including the hairs, a little less than a foot. The whole form bears considerable resemblance to that of the weasel, though the hair clothing the body is nearly 4 inches in length, and that of the tail equally long and pendulous, thus giving the animal the appearance of a shaggy dog. The head is broad like that of a weasel or mink, and rounded, with the ears and eyes small; the body is long and compact, indicating strength without activity. The legs are short, with the feet broad and armed with strong, sharp claws. The body is dark brown, black along the back, with a pale band from the shoulders along the flanks.

Some notice of this singular animal will doubtless prove interesting to our farmers; the more so as its history has been so mingled with extravagant fable that many have supposed the wonderful "glutton," mentioned by early writers, to be entirely a myth. It exists in the northern parts of Europe, Asia, and America. On this continent, it is abundant throughout the Arctic Circle, and has been found as far southward as the northern parts of the United States. Michigan has been called the "Wolverine State," whence it is evident that it once existed there.

Early writers on natural history have attributed marvelous peculiarities to this animal. It was said to be terribly destructive, supplying the lack of speed by strength and cunning, destroying whole families of beavers by breaking into their houses; and even capturing elk and reindeer, by climbing trees under which it dropped moss, and when the deer approached to feed upon this, springing down upon them and attaching itself by its claws, sucking their blood till dead,

and then devouring the whole carcass at a single enormous meal! In truth, however, the wolverine is no such terrible animal, nor is it a more ravenous eater than many other carnivorous mammals. It is allied to the weasels, belonging to the old family Mustelidæ, and is not unlike them in habits. It is stated that it feeds chiefly upon animals killed by accident, and preys on mice, marmots, and sometimes upon disabled animals of larger size. It is slow of foot, and cannot overtake the hare, nor does it appear able to capture grouse, &c., by lying in wait and springing upon them like the mink.

It is much hated by the fur hunters in the North from its destruction of their traps. It is so cunning as rarely to enter a deadfall itself, but will carefully pull it to pieces and then eat the bait in safety. I was informed by hunters at Selkirk Settlement that they sometimes lost the successful result of several days' trapping by a single wolverine, which, following their path, would pull down every deadfall, or destroy any animal already caught Of late years, strychnine has been used against the wolverines, and is highly valued by the white and half-breed trappers as their only protection; though I was told that the superstitions of the Indians led them to believe that the poisoning of these or other fur animals would bring down plagues from the Great Spirit; and such is their consequent dread that the trappers only use the poison in secret, lest they should provoke the resentment of the natives. Notwithstanding its slowness, the wolverine is persevering, and makes long journeys; one will follow the marten hunter's path round a line of traps extending forty or fifty miles, merely to obtain the baits, which are generally a piece of dried venison or the head of a grouse.

The wolverine possesses great strength, and frequently digs up the cached provisions of the fur hunters, sometimes thus causing much distress. Trappers with whom I conversed, and who had observed its habits where common, were of the opinion that it never habitually climbs trees, or seeks its food in the water, as was supposed by early writers. When attacked, it fights savagely, emitting the musteline odor peculiar to the family. It brings forth two to four young, annually. The fur of the wolverine resembles that of the bear, though finer, and is valuable for the manufacture of muffs, robes, &c.

CANADIAN OTTER.

Lutra canadensis, SABINE.

DESCRIPTION.—The dimensions of a full-sized specimen are—from nose to tail, 31 inches; tail to end of hair, 18. The color is glossy liver-brown above, a little lighter beneath; chin and throat whitish. The form of the otter is much like that of the mink. The head is large and broad, with the neck long and thick; the body is long and cylindrical, with the legs short and stout. The feet are large, and the toes connected by webs quite to the nails. The tail is large, and flattened horizontally. The body is clothed with long, rather stiff hairs, beneath which is a coat of dense soft fur, nearly as fine as that of the beaver.

This animal, though now very rare in many of the Eastern States, once existed abundantly throughout North America. Perhaps those

found west of the Rocky Mountains are of another species; but if so, their habits are much the same as those of their Eastern congeners. Though probably most numerous in the heavily-timbered regions, the otter also abounds in the lakes and streams of our Western prairies, as well as the wooded waters. Occasionally it is found even in the prairie sloughs in which there are no fish, but it never permanently inhabits these. It prefers clear deep lakes or running streams, and seldom lives in water that is at all turbid. It digs a burrow on the bank at the edge of the stream or lake, with the entrance under water, like that of a muskrat. Its burrow is not so extensive, however, as that of the latter animal, and it never constructs a house of any kind. In a capacious chamber, in its burrow, it forms a large soft nest of sticks, leaves, and grass; though sometimes it has been observed to take up its quarters in the bottom of a standing hollow tree, or in a cavity in a fallen one. The young, two or three in number, are said to be brought forth in March or April.

The ease and rapidity with which the otter moves through the water in pursuit of its finny prey is truly wonderful. It lives almost exclusively upon fish, nor does it, by any means, confine itself to the sluggish species, being frequently seen to capture some of the swiftest. In the mountain lakes of the Cascade range the Californian otter feeds largely on the Western brook trout and a species of Coregonus, both of which are very active fishes. Though preferring fish, the otter has been known to feed upon frogs, cray-fish, and even small univalve shell-fish. Cray-fish, indeed, sometimes form a considerable portion of its food, being taken in the water like the fish. I have observed this to be the case upon examining its excrement in Minnesota; and the same is noticed of the Californian otter. I have reason to suppose it sometimes devours the muskrats, in the houses of which it is occasionally found in the Western prairie lakes and marshes. It would probably eat any flesh when impelled by hunger; but it has never been known to devour vegetables of any kind when in a state of nature.

This is a nocturnal animal, and very shy, disappearing rapidly from inhabited districts, even when not hunted. It is eminently aquatic, more perfectly so than the beaver, and its whole form is admirably adapted to a life in the water. The great weight of its bones, which would make it more clumsy on land, enables it to dive and swim under water with ease. It never lives at a distance from the water, and, indeed, seldom travels far on land, moving awkardly out of its native element. In Minnesota, I observed, across a narrow isthmus separating two lakes, a well-worn path, which had evidently been formed by otters; and they seem generally to travel beaten paths when moving on land.

Birds and mammals, if not lower animals, amuse themselves by playing as much as human beings, and the otter doubtless enjoys its "slide down hill" as keenly as any boy does his coasting sled or skates. This curious habit seems to be indulged in by the otter at all times, when a suitable place can be found, though more in the love season than any other. It climbs to the top of some steep bank,

made slippery by the mud and water from its own body, or, in winter, by snow and ice, and, lying down with its fore-feet bent under, slides headlong to the bottom. Trappers inform me that they have often seen the otter thus engaged for an hour or more, scrambling eagerly to the top again after each descent, and greatly enjoying the sport. By using their knowledge of this peculiarity, the hunters sometimes succeed in shooting or trapping the otter at its sliding-place, which may be easily recognized.

Various articles of wearing apparel are manufactured from the fur of the otter. A steel-trap, baited with a fish, and placed under water, is usually employed to catch this animal.

SKUNK.

Mephitis mephitica, SHAW.

DESCRIPTION.—Length from nose to tail, 19 inches; tail to end of hairs, 14½. Color, black, with a white stripe along the head, and longitudinal white stripes on the back, varying in different specimens; tip of the tail white. The white markings of this species vary much in different specimens; but the animal is too well known to be mistaken for any other in the eastern portion of the Union.

In the western parts of North America several other species of skunks exist, and one—a very small animal, the Mephitis bicolor—is found in Texas, as well as in California. The Mephitis mephitica may be seen throughout the United States, east of the Missouri plains and north of Texas, and even as far as latitude 56° or 57°, in British America. On the western coast, it is replaced by Mephitis occidentalis and Mephitis bicolor. Skunks and badgers differ considerably from the rest of the North American musteline mammals, in organization and habits, and have been placed in a separate sub-family—Melinæ.

The skunk seems to be equally at home in the densely-wooded regions of the Atlantic States, and on the open plains of the West. I have observed it as abundant on the prairies as in the woods, in Illinois; and Western travellers inform me that it abounds on the Great Plains of Nebraska. It prefers for its home a dry, hilly, and, if accessible, a rocky locality. It digs readily, and excavates burrows for its habitation; and, on the prairie, at least, frequently captures small mammals by digging them out of their holes. Those who have opened its burrows on the prairie say that it digs a hole 5 to 10 feet in extent, and a foot or two below the surface; at the, end a large chamber is excavated, and in this a nest of soft grass is placed. The burrows, which I have observed, were always on high ground, and usually in sandy soil; they were never at the edges of water courses and ponds, like those of the mink. In rocky regions, its residence will be found in the crevices of the rocks, and such is its common habitation in the vicinity of Fort Laramie. I have occasionally known it to take refuge in fallen hollow trees; but here, as on the prairie, it digs extensive burrows, which are frequently occu-

pied as places of safety by the grey rabbit. It appears often to change its place of abode, or, at least, an individual will dig a number of burrows, like the badger.

The skunk is slow of foot, but nevertheless succeeds in overtaking many small animals. It feeds upon the lesser mammals, young birds, eggs, reptiles, and insects; sometimes even capturing rabbits by pursuing them into their holes. I have often followed the skunk in the woods, where it had taken the track of a rabbit, like the mink, and once observed where one had dragged the body through the snow to its burrow. It is a large feeder; and, by the numbers of insects and meadow-mice it destroys, is probably of sufficient service to the farmer to atone for its occasional attacks on the poultry; though, wher it has once found its way to the poultry-yard or hen-roost, its destruction of fowls and eggs is very great. Moreover, it is apt to take up its residence about the premises, like the weasel and mink; or it will retire to the woods, and return nightly to a renewal of the feast. At such times, it is more easily caught in traps than the mink, or poisoned by strychnine; and it is not active enough to escape good dogs, which, in despite of its disagreeable mode of defence, often kill it. The skunk being especially fond of eggs, these should be used to contain the poison, which may be introduced through a small opening in the shell, and closed by a piece of paper pasted with the albumen of the egg. A box-trap may also be used to capture this animal, whereby it will remain unhurt; and the emission of its peculiar odor about the premises will thus be obviated. It may then readily be drowned in the trap.

This species produces from five to seven young, which remain in the burrow, or only leave it for a short distance, until they are able to provide for themselves. It sometimes appears to live in families in winter, but is not generally gregarious, though fifteen have been found in the winter lying together in a nest. It is properly nocturnal, yet occasionally active by day, when it may be observed basking in the sunshine. It does not hybernate profoundly, if at all, and, in the latitude of Northern Illinois, its curious tracks may frequently be seen in the snow.

The skunk, like the rest of the musteline or weasel family, as well as the muskrat, beaver, musk-deer, civet, and some other mammals, has, below the root of the tail, two glands, which secrete a peculiar odorous fluid. Comparatively moderate in the other animals mentioned, this secretion in the skunk is so abundant and inexpressively offensive as to form an efficient means of defence, being ejected through small ducts to the distance of 10 feet, and, from its pungent and disagreeable odor, becoming a more potent weapon than is possessed by any other mammal of its size. Indeed, so far as danger from its natural enemies is to be averted, this forms a full substitute for its lack of speed; for, if the stories be true, that skunks have been devoured by birds and beasts of prey, their appetite must have been marvelously sharpened by hunger. It is a curious truth that this secretion of the skunk is analogous to that of the musk-deer, which

forms the perfumery so highly esteemed, the only difference being in the more disagreeable odor of that of the skunk.

The skunk is really a pretty animal, and makes a pleasant and interesting pet when not rendered disgusting by the emission of its secretion, which is only discharged during anger, and can be entirely prevented by the removal of the glands while young. Charlevoix, a French writer on natural history, named the skunk *l'enfant du diable*, and certainly it was hardly a misnomer.

The flesh, when not tainted with the secretion, is by no means unsavory, and is much esteemed by those who have eaten it. The Canadian and half-breed voyageurs on the Red River of the North consider it the most delicate of food, if properly prepared. When the animal is instantly killed, the body is not offensive, and the skin may be carefully removed without danger. The American and Hudson's Bay fur traders buy the skins in considerable numbers, which are manufactured into various articles of wearing apparel, though, it is almost needless to say, such furs are sold under a fictitious name.

AMERICAN BADGER.

Taxidea americana, BAIRD.

DESCRIPTION.—Length from nose to tail, 22 inches; tail to end of vertebræ, 5; tail to end of hairs, 6. Another specimen measured 29 inches from nose to tail; vertebræ of tail, 4¾; tail to end of hairs, 6¾. The body is broad, heavy, and clumsy, with the legs short, and the feet strong, armed with long, powerful nails, adapted to digging. The head is broad, with the nose pointed, and the ears short. The general color above is grizzly brown; a white stripe extends from the nose over the middle of the head to the neck; the end of the snout, a crescent-shaped patch before the ears, and the legs are black; the cheeks and under parts white.

This animal exists throughout the prairie regions of the United States north of latitude 35°; extending from Illinois and Wisconsin west to the Pacific. To the northward, it has been observed as far as latitude 58°, though not near the eastern coast of America. It is never found in the wooded regions of the Atlantic States; and is said not to exist in the forest districts of Oregon and Washington Territory, though abundant on the plains east of the Cascade range and of California. In Illinois, badgers were once numerous, at least as far south as the middle of the State; and were seen, thirty years ago, near the Kaskaskia River. They still exist in De Kalb county. Nature has especially adapted these animals to inhabit the prairies which cover so large a portion of North America; and, though they may occasionally be found in sparse woods near the plains, they never live habitually in the forest. The Taxidea Berlandieri, of Baird, another closely allied species of badger, is found in Western Texas, Mexico, and perhaps in Lower California.

Wherever it abounds, the presence of the badger will at once be detected by the numerous holes it excavates, both to form habitations for itself and in search of prey. It subsists to a great degree upon

mice and prairie squirrels, which it digs out of their burrows. On the plains, near the Red River of the North, in Minnesota, I observed in the vicinity of the gopher hills and among their burrows, many holes, which the old voyageurs told me, were dug by the badgers in the endeavor to capture gophers. It is doubtful, however, whether these efforts are often successful, as the innumerable galleries of the gophers afford an easy means of escape; but mice and prairie squirrels fall ready victims. No mammal, except, perhaps, the mole, can burrow with greater rapidity than this; and so agreeable is the habit, that, in confinement, it burrows whenever an opportunity occurs. Its habitation is not always so extensive as would be expected, and though the excavation is sometimes 6 feet deep and 30 feet long, at others it will be found only 2 feet below the surface and but 6 feet in length. As the badger cannot run fast, it ventures with caution from its hole, and invariably endeavors to return thither when alarmed. If attacked, it fights savagely, and is not easily killed by dogs. In consequence of its courage, the European species has been occasionally pitted against dogs by "sporting" men.

The badger is a solitary animal, or only lives in companies while young. Though more strictly carnivorous than the raccoon, it does not destroy the farmer's poultry. Indeed, it is soon driven off by the cultivation of its native prairies, or when it lingers, seldom disturbs the crops or burrows in the ploughed field. The havoc it causes among mice and insects fully compensates for the injury its burrows may be to the prairie; and, if not a very useful animal, it is not, at least, very prejudicial to the agriculturist. It feeds upon young birds and eggs, small mammals, insects, and probably reptiles. In Kansas, it has been observed to feed largely upon grasshoppers. Though it has been known to eat vegetable substances it is almost strictly carnivorous.

This is not a prolific animal; the female producing from two to five young annually. In Kansas, a female with two young was found in a large nest, composed of grass, and placed 2 or 3 feet below the surface, at the end of a burrow about 8 feet in extent. The badger is chiefly nocturnal, though occasionally seen out by day; as it has been observed basking in the sunshine, stretched upon the ground. It apparently hybernates in the far North, but in the warmer climates within its habitat, it is active throughout the winter. Its flesh is esteemed good food by the Indians and voyageurs, and its skin is becoming valuable.

AMERICAN BLACK BEAR.

Ursus americanus, PALLAS.

DESCRIPTION.—The dimensions of a large specimen are given by Audubon and Bachman as 6 feet 5 inches from nose to tail; the height 3 feet, 1 inch to the top of the shoulder. The general color is brownish black, with a spot of yellowish on each side of the nose. The animal is too well known to need a minute description. There is a variety of this species called the "Cinnamon bear," from its color; it cannot, however, be called a distinct species.

The black bear has been observed throughout the wooded portions of North America, and as far south as Mexico. It was formerly found

in Illinois, and probably still exists in some hilly and densely-wooded districts in the southern part of the State. Its home is in the forest, though it is frequently seen crossing the prairie from one body of woods to another. It abounds among the small groves which border the beautiful lakes of Northern Minnesota. Old voyageurs say that, in travelling from Pembina to St. Paul, they often found bears on the prairies, when a lively chase would ensue, requiring good speed in their horses, notwithstanding the clumsy forms of the game. I saw the track of a bear on the border of a nearly dry prairie pond, where it had evidently been feeding on cray-fish, mollusca, or small fishes.

This animal is omnivorous, and though of the order of carnivora, it appears generally to feed more upon vegetables than flesh; and it has been stated that it does not eat the latter from choice, but, when it has abundant vegetable food, will pass the body of a deer without touching it. As the backwoods farmer too often discovers, it has a remarkable partiality for pork; pigs running at large being sure to disappear whenever bears are in the vicinity; calves and sheep, and sometimes even larger animals, are also devoured. Unprovoked attacks upon man are said to be made by the bear, when impelled by hunger; but such stories must be received with caution, as they often have no other origin than the imagination of the narrator, who is ambitious to excel in "thrilling adventures." On the contrary, there is no well authenticated instance of such an attack; though, when wounded, the animal is savage and formidable, and the female will readily fight in defence of her cubs.

The black bear, with its snout and paws, turns over old logs, in order to obtain insects, and, perhaps, salamanders. Of vegetables, it eats nuts, acorns, berries, and various wild fruits, and digs up and feeds largely upon succulent roots. The corn and pumpkins of the backwoods farmer suffer considerable injury from its attacks, and green corn, also, is eaten with all the avidity of the raccoon. It "roots" with its nose, like the hog, among the leaves or earth in the woods for acorns and nuts, and always grows fat when "mast" is abundant. At times, it migrates a considerable distance in search of food, particularly in autumn, when the males travel southward in large numbers. In Michigan, it has been known to traverse many miles in order to reach a locality where the white-oaks bear a full crop of acorns. In Washington Territory it feeds much upon the succulent leaf-stalks of a species of skunk cabbage *(Symplocarpus kamtschaticus)* and also devours the exceedingly acrid roots of the Indian turnip *(Arum triphyllum.)*

The fondness of the bear for sugar in various forms is remarkable; and its habit of breaking into "bee trees" to get at the honey is well known. In captivity, it eats sugar or molasses eagerly. Berries and other sweet fruits are its favorite food. When feeding upon blackberries, of which it is especially fond, it stands upon its hind legs, and, drawing forward the tempting clusters with the fore-paws, carefully picks off each ripened berry, without injuring the green ones or breaking the bushes. This animal is a good swimmer, and frequently indulges in the exercise, though sometimes contenting

itself by wallowing, like a pig, in the mud. Its summer haunts are the edges of ponds and swamps, where it digs up and feeds upon the roots of plants, as well as upon reptiles, cray-fish, birds' eggs, &c.; but towards autumn, it resorts to high lands, and feeds on berries and nuts.

Its retreat is in the hollow of a large tree, either standing or fallen, or in a cavern or crevice in the rocks. Though it may sometimes scratch a slight hole under a log, it does not habitually dig burrows. Climbing readily, it often takes up its abode in tall trees; but is unable to ascend small ones, as it progresses by clasping the trunk with its legs and feet, and not by clinging with the claws alone. It is said that the female always, if possible, hybernates in holes in standing trees, where their cubs will be secure from wolves and other prowling enemies; but that the males generally take up their winter quarters on the ground, under the roots of trees or among rocks. In the far North, where there are no large trees, it is said the bear scratches away a portion of the soil from under a log, and retires to this slight excavation at the commencement of a snow storm, when the falling snow soon furnishes a warm covering. As its breath makes a small opening in the snow, the hunters frequently discover the retreat by the hoar frost about this opening; a thousand skins thus taken have been bought annually by the Hudson Bay Fur Company.

From two to four cubs, and sometimes five, are produced each year; an instance observed in Washington Territory is given, in which four young were produced, part of which were black and the rest yellowish-brown—thus proving that the varieties in color do not constitute specific differences. Though the black bear hybernates profoundly in northern climates, it is active during winter in the southern parts of its habitat. All hybernating mammals retire to winter quarters loaded with fat, and, as they take no food, of course, while torpid, this fat is consumed by even the slight degree of oxygenation taking place in the body during this state, and the result is that they are usually much emaciated in spring. Hybernating mammals that chance to be poor at the usual time of becoming dormant, will be found to continue active longer on that account; the system requiring an ample store of combustible material, in the form of fat, to produce the necessary amount of heat, by its oxygenation during the period when none is taken in as food.

The black bear is plantigrade—placing the whole sole of the foot upon the ground in walking; it stands readily upon its hind feet and haunches, and fights well in that position, dealing terrible blows with its fore-paws. Its flesh is excellent in autumn, when the animal has fattened on nuts and berries, and is highly esteemed by hunters. Bear skins were formerly of much greater value than at present; according to early writers, a prime skin, with the claws attached, was worth $100 to $200, but about the year 1829 the best sold for less than $10. Most of the Indian tribes have a veneration for the bear, and they will not start on a bear hunt until the whole race of these animals has been propitiated by ceremonies and speeches. As soon as one is killed, they place a lighted pipe in its mouth, beg its

pardon for their injury to it, call it their friend and brother—or, if a female, their grandmother—and, in long orations, endeavor to appease the supposed anger of its spirit. It is related that among the Laplanders the same veneration for bears is found, and a bear hunt is a most solemn affair, in which sorcerers must assist, certain ceremonies be observed, and the hunters sing a prescribed chorus during the attack, meanwhile begging the animal to do them no mischief. If successful, they sing to it praises and thanks for permitting them to return home in safety. It is also said that the Laplanders "never presume to call the bear by its proper name, but term it *the old man in the fur cloak*, because they esteem it to have the strength of ten men and the sense of twelve." The species under consideration is not, however, by any means, preëminently sagacious.

There are at least two other species of bears in North America: the white bear of the Arctic regions and the grizzly of California and the Western coast. The latter is the most formidable animal in America, if not in the world.

RACCOON.

Procyon lotor, LINNÆUS.

DESCRIPTION.—The dimensions of a full-sized specimen are, about 2 feet from nose to tail, with the tail 10 or 12 inches to the end of the hairs. The head is broad, with a small pointed muzzle, and moderately large ears; the body is rather stout, densely clothed with long, coarse hair, overlaying softer fur; the tail is large, round, and of uniform size, clothed with long hair; the soles of the feet are naked. The general color is grey, mixed with black above; the tail is alternately ringed with black and grey; a black stripe extends across the face, producing a spectacle-like appearance, which, together with the animal's monkey-like movements, gives to its physiognomy a very comical expression.

Though careless observers might not see any considerable resemblance in the raccoon to the bear, yet it may not improperly be called a little bear with a long tail. The older naturalists placed it in the same genus with the bear, and in a more recent classification it is, even by writers fond of multiplying divisions, still retained in the family Ursidæ, or the bears. No one, however ignorant of comparative anatomy, can fail, on a critical examination, to see the close resemblance of the raccoon to the bear in nearly every feature of its organization; the size, color, and length of the tail constituting the only striking difference.

The raccoon exists throughout the wooded portions of the Union; but in Southwestern Texas and on the Pacific coast, it is replaced by a closely-allied species—the Procyon Hernandezii, of Wagler. It is properly an inhabitant of the woods, preferring those which are low and heavy, and even swamps. Though it may sometimes be found a few miles out on the prairie, in summer, it does not live permanently far from forests.

The raccoon is omnivorous. It eats flesh of any kind, preying upon small birds and mammals, when it can catch them, and some-

times making destructive forays into the poultry-yard. It devours birds' eggs whenever within reach, procuring the eggs of woodpeckers by thrusting its paws into their holes; it also watches turtles when depositing their eggs in the sand, and, upon their departure, digs them up. This animal is fond of fish and displays remarkable dexterity in capturing them with its fore-paws. It is also a most successful frog hunter, and may frequently be tracked along the river's edge where it has been searching for frogs, cray-fish, "water snails," and dead mussels. In summer, frogs often form a large portion of its food, when some species leave the water and therefore are easily caught. Insects are eaten to some extent, as are slugs and snails. It also feeds largely upon various vegetables in summer; and its particular fondness for green corn is well known to every farmer. When this grain is in the milk, a visit may be expected, if the home of the raccoons happen to be near the field; and, indeed, they will sometimes travel the distance of a mile or two to obtain a feast of their favorite food. They pull down the stalks or break off the ears, and, tearing open the husks, gnaw the juicy kernels, generally destroying far more than they actually eat. They feed upon the spot, and do not carry away the corn. In winter, they will occasionally eat the ripened grain, and have been known to visit open corn-cribs for that purpose. They are also said to eat acorns and to gnaw through pumpkins to procure the seeds; probably, like the bear, they feed more or less on berries. In confinement, they are exceedingly fond of sugar. Like the squirrels and spermophiles, they sometimes dig up newly-planted corn.

The raccoon exhibits a roving disposition, and the males, in summer, frequently change their place of abode, wandering considerable distances on the prairie, and finding temporary homes in the deserted burrows of the badger, wolf, or skunk. They return to the woods, however, before winter, and though I am informed that one has been found hybernating under the long prairie grass, several miles from any woods, it had doubtless been surprised in that situation by sudden cold, and forced to take shelter. Its usual retreat is in a hollow tree, and it never digs for itself, though, in the forest as well as on the prairie, it will occupy the deserted burrows of other animals, and even rear its progeny in such habitations. From three to six young are produced. These acquire their growth rather slowly, but are active, and make pleasant pets. They exhibit a remarkable degree of intelligence; and their monkey-like tricks are very amusing.

Like the black bear, the raccoon hybernates in the latitude of Northern Illinois. Its hybernation is not profound, however, only continuing during severe cold, and in mild days in mid-winter, I have frequently seen its tracks, and caught the animal in an active state. It probably does not hybernate at all in the South. Though chiefly nocturnal, it is sometimes found feeding in corn-fields by day. I once observed one, with its head and shoulders thrust out of a hole in a large hickory tree, in which position, if undisturbed, it would remain for hours, enjoying the sunshine. This mammal uses its paws with

great facility as hands, always holding objects in both at once, but not commonly using them while eating. From a singular habit of dipping its food in water, as observed in captivity, this species obtained its name of lotor, or "washer." Its hearing is remarkably acute, and it seems to depend more upon this sense as a protection from danger than other animals of this class.

In autumn, when it has been feeding on vegetables, its flesh is palatable, and highly esteemed by backwoodsmen. The fur, like that of the bear, and used for similar purposes, is valuable.

INSECTS FREQUENTING THE ORANGE TREES OF FLORIDA.

Y TOWNEND GLOVER, OF FISHKILL LANDING, NEW YORK.

The wild orange is found in abundance, growing in clusters or natural groves in the forests bordering the St. John's, often flourishing under the shade of the magnificent live-oak, magnolia, and other trees, and appearing to prosper even when standing singly in the densest thickets of underwood. These wild trees, though generally quite small in comparison with the trees of the older cultivated groves, were examined with much interest, because of the common belief that the "wild orange," or "sour orange," when growing in a perfectly wild state, is not attacked by the much dreaded coccus, orange scale, or bark-louse, as the insect has been variously named. But this belief was found to be erroneous; for, out of the hundred examined, thus situated and growing on a variety of soils, there was not one on which the scale did not exist in greater or less numbers. It is worthy of remark, however, that those growing on rich soil appeared to be much less liable to the attacks of the scale than such as were found on poorer land, which fact appears to indicate that, if the soil of the sweet orange groves were improved by means of manure and careful cultivation, the trees would acquire the requisite vigor to throw off the insect, and perhaps eventually outgrow its attacks, and annually bear a medium if not a good crop of fruit. This opinion derives increased force from the statement generally made, that upon trees injured by frost, the scale insect appears in the ensuing summer in more than usual numbers, and most plentifully on those most severely injured, and consequently most impaired in vigor of constitution.

The female of the scale insect, or coccus, which has almost effected the destruction of the orange groves in Florida, when fully grown, is about 0.06 to 0.08 of an inch in length, by 0.02 in breadth at the broadest part, and when examined with a magnifying glass, presents the appearance of the upper valve or half of a brown mussel shell, placed with its flat or convex side downward upon a leaf. This thin convex shell, or case, which is three or four times as long as it is broad, covers the insect, and appears to be increased in size by successive layers of a waxy, or rather parchment-like secretion, which

shelters the soft and tender body of the worm beneath from the vicissitudes of the weather. These scales, when placed singly upon a leaf, are generally found to be straight in form, but when clustered together, are curved to suit the inequality of surface or contiguity of the neighboring scales. They increase in size as the insects themselves increase, and their brown color varies from light to very dark. They are mostly tinged yellowish toward each end, and, in perfect specimens, are surrounded, except at the apex, or smaller end, by a nearly colorless flat margin, which is so securely cemented to the leaf on which the insect subsists as scarcely to be removed, except by being scrubbed off with a stiff brush, or scraped off with some hard substance. The insect inhabiting this protecting shell is of a very soft consistence, and, when fully grown and removed from its case, resembles a tender, fleshy, footless grub. Its body gradually tapers from near the tail to its anterior part, which is obtusely pointed. From the under side of the breast proceeds a sucker, or trunk, by means of which, it extracts from the tree the sap that constitutes its only nourishment. The body is divided into several segments, and varies in color from light cream yellow to rosy pink. This variation may perhaps be owing to the different ages of the specimens examined, as the females ascertained to be about to lay eggs, or to have laid them, were generally of a pink color. The female deposits her eggs, to the number of twenty or thirty, in parallel rows, under the outside shell; and, as they are laid, she gradually decreases in size, and eventually dies and dries up in the smaller end of the case, never producing more than one brood. The eggs hatch in a few days, according to the temperature of the weather, in the order in which they have been laid, some of the young at times escaping from beneath the maternal shell before the parent female has deposited all her eggs. The young coccus then resembles an extremely minute white mite, and has six legs, two antennæ, and a body consisting of several segments, and moves with considerable rapidity for some days on the surface of the leaf, in search of a suitable place to insert its proboscis, or sucker. It is possible at this period to confound it with the numerous mites which, also, infest the leaves of the orange tree, and appear to feed upon the dead insects and various other substances, and which are frequently found under deserted scales; but it may readily be distinguished from them by having six legs and two antennæ, instead of the eight longer curved legs of the true mite. After the place is selected, the beak inserted, and the insect settled for life, a slight whitish film is formed over its back, and the insect is in a short time completely hidden from view, and feasts undisturbed and motionless, under its scaly shelter, upon the sap. Here it increases in size, assumes its brown color, and in a few weeks produces new broods to spread ruin and devastation among the orange groves. It is in this young state that these insects should be destroyed, for then their bodies are soft and unprotected, and they are not impervious to liquid applications, as when encased in their hard and almost air-tight coverings.

The process of hatching and reproducing appears to be going on from May to December, without cessation, as the insects may often be found in almost every stage of growth upon the same leaf and at the same time. When solitary, the large, dead female is frequently found surrounded by a cluster of her young; but when these are removed and placed upon other leaves, they almost invariably select the vicinity of a rib or vein, or the margin, as a suitable place to found the new colony. It is highly probable that it is when in this young and migratory state that they are transported from tree to tree by the wind, or by birds, or by other insects, or by falling leaves, and other accidental agencies; for the females themselves are not provided with wings to escape from their native trees. When once fixed, they die, if subjected to a forcible removal. Young and tender branches and leaves do not appear to be so subject to their attacks as the old or more mature parts of the tree are, the lower branches and leaves generally suffering the most, and being often killed, while the top and vigorous younger shoots are comparatively untouched. Trees branching out near the ground, so as to form a shade for the roots, appear to be much more healthy and vigorous than those grafted or budded high up, and having tall and naked stems, and consequently no shade to protect their roots from the heat of the scorching sun. Some cultivators even go so far as to maintain that the orange tree thrives best in the shade, and therefore suffer the oak and other large trees to grow among them, as in their native groves, though the roots of these trees necessarily take from the soil nutriment which otherwise would go to the orange.

The scale of the male coccus is much smaller and broader than that of the female. Under it, a minute footless grub exists, as already mentioned in the description of the female. After sucking the juices of the tree for some weeks, this changes into a pupa under the case, having a body consisting of segments, a thorax, antennæ, wings, legs, and head, plainly developed under the skin; but it is incapable of locomotion. After remaining in this state for a number of days, determinable by the temperature of the weather, the perfect insect emerges from beneath the shell in the shape of an exceedingly minute two-winged fly, and after resting a short time to dry its wings, flies off to neighboring trees in search of a female, and then dies. Many persons state that they have seen swarms of these midges in the summer performing strange evolutions in the air; but this is to be doubted, since the male of the scale insect is so exceedingly small as not to be discernible to the naked eye even in the smallest bottle of alcohol, unless when particularly pointed out with a fine needle. The mistake may have originated from the fact that very minute gnats swarm in orange groves near the water in warm weather in the manner mentioned. The male is about 0.01 of an inch in length, and of a pinkish color. It possesses two long antennæ and six legs; the head is rounded, the eyes black, and the mouth appears to be obsolete; there are two transparent wings, and the anal extremity is furnished with a long, curved, bristle-like appendage. It is here worthy of observation that, although several parasitical four-winged

flies, belonging to the family of the Chalcididæ, were found infesting the other coccus, or scale insect, hereafter mentioned, and in many cases entirely destroying them, yet no parasitical fly of any kind could be discovered destroying these mussel-shell-shaped scale insects; and it may be owing to this fact that they multiply so much more abundantly than the other kinds. It is possible, also, that when the insect itself was imported to this country, the parasite was left behind, and hence their rapid increase, unchecked by their natural enemy. Several experiments were made to destroy them by means of liquid applications, such as soda, sulphur, coal-tar, aloes, spirits, syrup, lime, and, in fact, all the heretofore prescribed remedies. The experiment of boring into the tree and inserting sulphur and calomel, has also been tried, but, as foretold, without any effect. Coal-tar, sulphur, and aloes, at first appeared to have a little good effect, but were discontinued because of the superior efficacy of Peruvian guano mixed with soap suds. This mixture seemed to have the desired effect, when applied by means of a syringe about once a week, the soap and ammonia killing the young coccus as it first emerges from the female scale, in its soft and unprotected state, or before the young scale has become impermeable to the liquid preparation. The soap causes the liquid to spread over the surface of the leaves, which it otherwise would not do, owing to the waxy coating of their surface. In preparing whatever liquid mixture may be designed for use, it would be well to observe this fact; since, when water alone is used, it is apt to remain on the surface in drops or patches, and not to spread over the leaf, or reach the parts principally affected by the coccus. In one grove, on a side-hill, it was observed that the scale insect was most numerous at the places where, owing to continued rains, the soil had been washed away, and the roots of the trees exposed. The health and vigor of these trees were checked; and, as already stated, the coccus always selects diseased trees, or such as have been accidentally injured. In planting new groves, it would be well to choose neighborhoods in the vicinity of which there are no wild orange trees; to examine carefully every young tree to be planted, and, if the least sign of a scale be found on it, either to reject it at once, or cause it to be scrubbed with a strong solution of guano and soap suds until it is perfectly certain that no scale or egg remains. Orange fruits from other places should never be brought upon nor near these new groves, as the insect is often communicated by means of the rind, to which it adheres. In one place examined, where a young grove was about to be planted, there was observed lying on the ground the rind of an orange which had been brought from some other region. Upon being taken up and examined, it was found to be covered with the scale insect, in numbers sufficient to stock the largest grove in Florida in a few years. Trees that turn yellow should be immediately examined, and if the scale be detected, they should be syringed until it has entirely disappeared. The liquid guano, also, dripping on the ground, will enrich the soil under the tree, render the foliage more vigorous, and enable it to throw off the scale. The preparation recommended should be applied regularly

every week, although no perceptible benefit may be seen for the first few weeks, as numbers of the old females remain undestroyed in consequence of the impermeability of their outer covering or shell, and adhere to the tree until their whole stock of eggs is deposited. The best means of ascertaining whether the old scales are destroyed is, to rub the leaf somewhat roughly with the finger, when, if the life of the insect is destroyed, the scales will immediately come off. Orange, citron, and lemon trees were all found to be subject to the attacks of this bark-louse, and the only other tree or shrub upon which it was seen was a Camelia japonica that grew under the shade of an orange tree; but it had only a few scale insects upon its leaves, and they did not appear to thrive and multiply as when on their natural-food, the orange leaf.

Another scale insect found upon the orange trees was not in such great numbers as this coccus, and pervaded the fruit-stalk or was scattered more sparsely upon the leaf. It was very similar in shape to that which infests the under side of the leaves of the Oleander, in Florida, and may perhaps prove to be identical with it. The scale is about 0.1 to 0.16 of an inch in length by 0.08 or 0.1 in breadth, and shaped like a convex oyster shell, with a broad flat margin all around the convex part, anteriorly notched with two indentations on each side, and, in the middle of its posterior part, having a deep indentation reaching to the convex and darker portion of the scale. The young, when first hatched, are soft and yellow and have two antennæ and six legs. The hinder part is notched and terminates with two long bristles or hairs. When older, these hairs disappear, and the upper part, or skin of the young insects, seems to harden into a kind of scaly covering; and, with legs and antennæ not yet covered up entirely, it wanders about the leaf, presenting much the appearance of a very diminutive tortoise. Eventually, the legs and antennæ are covered up completely with this coat of mail, and the grub beneath settles down, fastens itself to the leaf, and extracts the sap by means of its sucker, which is placed under the breast, as in the first-mentioned scale insect. The young scale is of a light cream yellow, but the convex part soon assumes a dirty brown hue, with its flat margin much lighter in color. Although living specimens of this insect were confined in glass, and examined every day for months, no perfect male could be discovered, and even most of the females were destroyed by numerous four-winged flies, belonging to the family of the Chalcididæ. These flies lay their eggs in this scale insect. The minute, fleshy, footless grubs hatched from them devour the insect inside the case, and in a few days, change into pupæ having the rudimentary form of the perfect fly, but being incapable of locomotion. They subsequently, however, come out of a hole gnawed in the upper part of the shell, or scale, as perfect four-winged flies, to lay their eggs, in due course, in the remaining scale insects. All these changes are experienced within a few weeks. The scales destroyed by these parasites may be known by their turning nearly black, and by the minute hole through which the fly has made its exit. Were it not for these insect

auxiliaries, this coccus would, no doubt, increase a rapidly and do as much injury as the mussel-scale.

A small black lady-bug (*Chilocorus bivulnerus*) about 0.2 of an inch in length, with two red spots on its outer wing-covers, also destroys this coccus, as well as that first described, and likewise feeds upon the orange aphis, or plant-louse. The eggs of thi lady-bug being deposited by the female on the leaves or trunks of trees infested, hatch in from three to six days. The young larvæ resemble in appearance small spiny alligators. They have six legs, and are incessantly prowling about in search of their prey, which consists of the scale insects and orange plant-lice, and during both its larva and perfect state, it destroys immense multitudes of these insect pests. When ready to change into pupæ, they fasten themselves to the leaves, and the skin of the back splitting open, the pupa appears inside through the aperture, immovable and apparently lifeless; but in from three to six days more, the perfect insect comes out, feeds upon the scale and louse, pairs, deposits its eggs, and dies, leaving a numerous progeny to thin the number of our insect depredators.

Another very small cocinella, or lady-bug, (*Euchomus guexi*,) about 0.14 of an inch in length, of a red color, with black thorax, and two black spots on the wing-covers, near the hinder end, also abounds in the orange groves, and destroys numbers of orange lice and scale insects, when in the young and soft state. The larva is very small, being about 0.18 of an inch in length, yellowish, with black spots and spines. It also forms a perfectly motionless pupa, adhering to the leaf, and destroying all smaller soft-bodied insects, both in its larva and pupa state. The lady-bugs, with very few exceptions, are of the greatest benefit to the planter and farmer, as, but for them, plant-lice of all descriptions would multiply so fast as to destroy most of the vegetable kingdom.

The young shoots and tender leaves of the orange are very subject to the attacks of the orange plant-louse, or aphis. This insect is about 0.06 to 0.08 of an inch in length, and lives in large societies, sucking the sap by means of a proboscis which it inserts into the tender leaves. It has two anal tubercles on the upper part of the hind body, which secrete a sweet viscid substance. The four transparent wings of the winged specimens are held in a perpendicular position when the insect is in repose, and are deflexed at the sides, so as somewhat to resemble a very steep roof. The body is generally green, mottled and shaded with a much darker color down the back and along the sides. Many specimens, however, were found nearly brown black. Most of the orange lice, kept in confinement during the month of August for examination and experiment, acquired wings and flew away. These insects usually select new shoots upon which to commit their depredations; and were it not for the lady-bugs and certain other insects hereafter to be mentioned, which keep their numbers in check, they would scarcely allow any new growth to be made, since, when they attack and drain out the sap, the leaves turn yellow, curl up, and become of little or no use to the tree. A solution of whale-oil soap, or soap suds and guano, syringed upon the places affected, will gener

ally destroy them. But the solution should be made with care; for if it be too strong, the 'ender shoots will be very much injured, if not totally destroyed. I would recommend a weaker solution than that applied to the scale insect, as this for the most part inhabits young leaves and shoots which cannot resist a too caustic application. Having observed many empty skins among a flourishing colony of these lice, in August, I again examined the twig in a few days and found that the living insects had almost entirely disappeared from the infested leaves, and that many of the skins remaining had either been sucked entirely dry, or were found only as hard cases, or merely outside shells, with a minute hole perforated in the back of each. Among the few lice remaining in a living state, there were seen hunting about the leaf numerous, small, green, footless grubs, about 0.3 of an inch in length, banded near the middle with flesh color across the back, and having a broad stripe of the same color, bordered with dark brown on each side, extending down the mid-back from this transverse band to within three or four segments of the extremity. These grubs were very busy foraging for food. which consisted of the juices of the plant-lice. When one of these was seized by the grub, it was held up from the leaf and, in spite of all its struggles, the juices were sucked out by the relentless destroyer, and, the repast being finished, the empty skin was cast away and the grub proceeded in search of a fresh subject of prey. When ready to change into a pupa, the grub fastens itself to the leaf, the skin of the body contracts and hardens, forming a somewhat pear-shaped case, of a brownish color, with a large spot of flesh color, making in some specimens a broad transverse band extending from the middle to near the extremity of the body. Within a few days, a two-winged slender-bodied fly made its appearance, with head brownish; thorax small and dark-colored; body long, attenuated, and nearly black; with transverse broadish bands of brown, and wings beautifully clouded with brownish black. These flies destroy numbers of aphides, as likewise does the parasitical four-winged fly, belonging to the family of Ichneumonidæ, which latter lays a single egg in each louse, which, hatching in the body of the insect, produces a small grub that, after devouring the inside, changes into a pupa, and eventually comes out of a hole gnawed in the back, to lay eggs in the other lice. This fly is scarcely 0.02 of an inch in length, has four transparent but somewhat clouded wings, a body attenuated and wasp-like, head black, legs brown, and banded near the joints with black, fore part of the thorax brownish, the attenuated or fore part of the abdomen brown, and the other portion, or nearly two-thirds to the extremity, black. More correct and exact observations could not be made of these and other diminutive insects, the glass used being of too limited power for such exceedingly minute flies.

Among these lice were also seen small red insects spotted with white and black and having long, slim black legs and antennæ, each with a plant-louse adhering to the end of its long beak. These were the young of * * * * * [?], and subsist altogether on animal or insect food. When fully grown, these measure nearly 0.8 of an inch in

length, and have long slender and jointed antennæ. The head is elongated and red, the eyes black, the thorax red, with a black mark in the centre; the anterior part of the upper wings black, shaded with red, and a large oval spot of black extending from this red to the extremity of the wings; the scutel, and a part surrounding it, red; and the legs black and slender. These insects are also of much benefit, as they constantly prowl around upon the trunk, limbs, or foliage of the orange and other trees and shrubs during [summer?] and fall, and destroy every insect they can overpower.

Crowds of small blackish insects, somewhat like plant-lice in wings and shape, but larger in size, belonging to the family Psocidæ, are often seen swarming in almost compact masses upon the trunks or limbs of the orange tree. These insects are about 0.2 to 0.24 of an inch in length, of a blackish color, the abdomen is black banded with yellow, the thorax very much humped, the upper wings are black, veined with yellow, having a white spot on their outer margin, and the antennæ very long and slender. When disturbed, they disperse and endeavor to hide themselves by running to the opposite side of the trunk or branch. The larva and pupa resemble the perfect insect, except that the former has no vestiges of wings, and the pupa only the rudimentary forms. But, as this family generally are harmless to vegetation, it is supposed that they merely frequent the trees for the sake of minute insects and decaying vegetable matter usually found in such places. I could not discover that they produced any injury. The caterpillar of a large black and yellow butterfly *(Papilio thoas)* is very destructive to the foliage. When fully grown, it is about 2.6 inches in length, of a clouded ashy-grey color, with numerous eye-like spots, and a large rosy cream-tinted spot of a somewhat triangular or saddle-like shape on its back, beginning at the fourth segment and ending in the eighth; a similar large mark, also rosy cream color, extends from the ninth segment to the extremity of the body; a line of the same color extends from the head, on each side, to the middle of the sixth segment, where it meets the lozenge-shaped spot on the back. It may easily be recognized by its fat, greasy and unwieldy appearance, and, when disturbed, by the protrusion of two long red filaments, or horns, producing a very disagreeable smell, from the first segment of the body. These horns are, no doubt, furnished by Nature to enable the caterpillar to protect itself from destruction by ichneumon flies, as, whenever it is touched, it always inclines its head towards the place disturbed and endeavors, with these strong-scented filaments, to brush the part touched. When fully grown and prepared to change into a pupa, the caterpillar spins a slight web attached to a leaf or branch, in which to insert its tail when it becomes a chrysalis, and to which it clings with its two hind-feet while yet in the caterpillar state. It then spins a thread across its back, with each end fastened to the branch. Thus suspended with its back downwards, it casts the caterpillar skin, and changes into a chrysalis with two blunt projections to the head part and a somewhat humped back or thorax. This chrysalis is of a greenish color, varied on the back and fore part with clouded blackish brown. It is about

1.4 inches in length. In from six to fourteen days, according to the temperature of the weather, the skin of the back of this chrysalis splits and the butterfly emerges, with wings at first small, wet, and flabby; but soon, the vessels become filled with air, the wings expand and dry, and a splendid black and yellow-banded swallow-tailed butterfly takes its flight to feed upon the nectar of flowers, and to pair and lay its stock of eggs in the orange groves, taking care, however, not to place more than one or two on a leaf; and, finally, when it has thus laid the foundation for new colonies of worms, or caterpillars, to disfigure and destroy the foliage of the orange groves, it becomes weak and ragged, and eventually dies. This butterfly should be destroyed whenever seen, as by killing the perfect female, an embryo brood of noxious caterpillars will also be destroyed, and the foliage to that extent protected. The perfect butterfly is very large, measuring above 4 inches across the wings, the hind part of which terminate with two swallow-tail-like appendages. The ground color of the upper part of the wings is black, with a broad stripe, or row of interrupted large dots, from the upper corners of the fore wings to the body, extending across the basal part of the hind wings. This row of interrupted yellow spots is continued around the wings. Near the margin and above the end is an eye-like red and blue spot on the interior part near the body. The thorax is black and yellow in stripes, and the body yellow with black spots on each segment.

A small hang or drop worm (Oiketicus) is very prevalent upon orange leaves, and is found most frequently suspended from the leaf, entirely enveloped in a brownish, oblong, oval case, of a paper-like substance, spun by the worm within, and interwoven with dried scraps of the leaf itself, or any other material, over which the worm may wander. The male case is about 0.5 of an inch in length. Within it lives the worm, which is 0.3 of an inch length, and of a brownish color, clouded or spotted with darker brown on the head and two first segments, protruding only its head and first segments when feeding or moving from place to place. Within this case, which is spun from the worm itself, is found a chrysalis of a dark brown color, which, when about to change, pushes itself nearly out of the opening in the lower extremity, when the back splits, and a small moth of about 0.5 of an inch in breadth across the expanded wings, of a black color, and having feather-like antennæ, comes out. The female case is much larger, measuring 0.7 of an inch in length, and is formed of the same materials as the male case. The female, however, never acquires wings, but, when ready to change, fastens the case to the leaf with silk, lays its eggs, and dies in the case which it had constructed as a shelter for its soft and fleshy body. The eggs are likewise laid in this case, and the young, when hatched, escape from the orifice at the lower end, and disperse over the tree in search of food. A parasitical worm or grub was found in one of these cases, destroying the insect within; but as it died before changing into the pupa, it could not be ascertained what four-winged fly it would have changed into. These drop-worms may easily be removed by the hand if ever they should become too numerous.

Two species of large green Katydids are also very injurious to the foliage of the orange, from their very infancy devouring the young and soft leaf. They are of a green color, like the foliage of the trees, and their wing-cases are ribbed like the leaves. When fully grown, the largest kind measures 2.3 to 2.6 inches in length from the head to the extremity of the closed wings, and is provided with very long and slender hind-legs, very long antennæ, and a curved, scimeter-shaped ovipositor, at the extremity of the abdomen. When disturbed, these insects first spring from the leaf, and then, extending their leaf-like wings, fly to neighboring trees. Their eggs are deposited in rows of from eighteen to twenty-six or more upon the margins of the leaves, and appear like strings of flattened, oval, grey beads. These eggs should be destroyed as soon as discovered, since the Katydids are extremely watchful and agile in their perfect state, and very difficult to be captured or destroyed even when in the larva and pupa conditions, though they are then unable to fly, their wings being but imperfectly developed. There is also a so-called grasshopper, or locust, about 2.4 inches in length from the head to the extremity of the wings; the head, thorax, and body being of a green color, the latter banded with yellow on the segments, with a yellow spot on the head, under the eyes, and another on the sides of the thorax; the wings are greenish brown, and there is a yellow stripe extending from the head down the middle of the thorax and centre of the wing-covers; the hind-legs are long, robust, and green, having a yellow spot bordered with black on the underside of the extremity of the thigh, near the joint. The larva and pupa are green; the former have wings undeveloped, and the latter only partially so. As they are only capable of jumping, they ought to be sought for and destroyed in this state. A very large so-called grasshopper, commonly known as the "lubber," from its sluggish and voracious habits, is also very destructive to the orange leaves. When fully grown, it is about 2.4 inches in length, of a yellow color, barred and spotted with black. The wing-covers are extremely short, reaching only half-way to the extremity of the abdomen, and are totally useless to the insect for the purposes of flight. These wing-covers are yellowish, shaded with rosy pink, and barred and spotted with black. The larvæ are shaped like the mature insects, but have not the rudiments of wings. They are of a black color, beautifully striped and banded with orange yellow. The pupæ have very small rudimentary wings, and are black, shaded and bordered on the thorax with yellow, the abdomen banded and hind-thighs bordered with the same color. These insects destroy many garden vegetables and plants, and may be seen crawling sluggishly over the ground or upon shrubs, and are so nauseating that even the fowls reject them as food. As they never fly, but merely creep, or jump heavily, they can easily be destroyed by crushing with the foot in every stage of their existence.

Several other grasshoppers and locusts were found on the orange, but those named in the foregoing do the principal damage. Ants also are found on these trees, and feed principally upon the honey dew ejected by the orange plant-louse. They may also often be seen

wandering among the orange scale insects, and feed perhaps on the excrementitious substances, or on the dead insects they find in such situations. There are several insects which may be seen eagerly sucking the fluid of wounded trees, but as they do no injury, they need not be described. In cases where the trees are wounded, or the bark scraped off, it would be well to wipe the surface dry, and then cover it with a thin solution of gum shellac, dissolved in alcohol, which immediately dries and forms a thin coating impervious to water, and also prevents insects from depositing their eggs under the bark at the sides of the wound, where they might penetrate into the wood and injure the tree.

REMARKS ON THE ORANGE TREE.—The common orange, (*Citrus aurantium*,) from which it is believed all the present varieties or races of this fruit have originated, was a native only of the warmer parts of Asia, but has long since been acclimatized in the countries adjacent to the Red and Mediterranean Seas; in the temperate and inter-tropical isles of the two great oceans and other seas; and in the milder portions of Africa, America, and Australia. It is especially cultivated with a view to profit, in Portugal, Spain, France, Italy, Greece, Turkey, Syria, Egypt, Northern and Southern Africa, India, China, Japan, and on many of the islands adjacent to these countries; also in the Azores, the West Indies, Brazil, and the most temperate parts of the United States.

The first distinct notice of the orange on record is by Avicenna, an Arabian physician, who flourished in the tenth century. It is stated by Gelesio, a modern Italian author, that the Arabs introduced this fruit into Europe by two routes—the sweet oranges through Persia to Syria, and thence to the shores of Italy and the south of France, and the bitter ones by Arabia, Egypt, and the north of Africa to Portugal and Spain. It was the opinion of this writer, who described forty of the principal kinds, cultivated in Italy, that they were all derived from the same species—an opinion which appears to be corroborated by the circumstance that the whole citrus family is prone to change, from a difference of soil and climate, as well as from a tendency to "sport," when cultivated from seeds, after the manner of most of our orchard fruits. In many parts of the West Indies and South America, for instance, the whole orange tribe is found growing wild, springing up spontaneously from the seeds of the trees originally planted by the Spaniards, varying in size and every gradation from the lime to the shaddock. Oranges are often met with equal in flavor and sweetness to those of the Azores, though much larger in size, while others vary from this to a degree of sourness and bitterness sufficient to draw blood instantly from the mouth, accompanied by severe pain. There you may see the lemon, the citron, the lime, the shaddock, the forbidden fruit, the sour, the bitter, and the sweet oranges growing indiscriminately together, in the same valley or wood. They are round, flattened, rough, smooth, obovote, pear-shaped, thick and thin-skinned, juicy and dry—some with and others

without seeds—some bearing seeds at the eye, outside of the fruit, while others present a navel-like protuberance, at the same point, with no seeds. In passing through these countries, some trees will be observed to contain little or no fruit, while others are loaded to excess.

In Florida, the orange also grows spontaneously. In noticing the town of New Smyrna, in 1791, Bartram, in his "Travels," observes: "I was there about ten years ago, when the surveyor run the lines of the colony, where there was neither habitation nor cleared field. It was then a famous orange grove, the upper or south promontory of a ridge nearly half a mile wide, and stretching north about forty miles. * * * * * All this was *one entire orange grove*, with live oaks, magnolias, palms, red bays, and others." He also make frequent mention of extensive groves of wild oranges, in Florida, as far north as latitude 28°. Dr. Baldwin, in 1817, in speaking of Fish's Island, says: "Here are the remains of perhaps the most celebrated *orange grove* in the world. Some trees still remain that are 30 feet in height, and still retain a portion of their golden fruit." In the same year, in describing the beauties of the St. John's, he says: "You may eat *oranges* from morning till night, at every plantation along the shores, while the *wild* trees, bending with their golden fruit over the water, present an enchanting appearance." These trees are not regarded as originally natives, but were introduced by the Spaniards, at the time they settled Florida, or by a colony of Greeks and Minorcans, who founded New Smyrna, in 1769, while that country was in the possession of the English. Mr. Audubon, as late as 1832, observes: "Whatever its original country may be supposed to be, the wild orange is, to all appearances, indigenous in many parts of Florida, not only in the neighborhood of plantations, but in the wildest portions of that wild country, where there exist groves fully a mile in extent." This wild fruit is known in Florida by the name of the "bitter-sweet orange," which does not differ materially from the Seville orange, and probably originated from that variety. The occurrence of these trees, wherever they grow, is a sure indication of good land.

For many years, no small degree of attention was paid to the culture of the common edible orange, at St. Augustine, and on the river St. John's. The number of trees owned by different individuals, prior to 1835, varied from 1,000 to 1,500. Perhaps no person in Florida had more than the latter number in full bearing condition, at the time of the great frost, which occurred on the 9th of February of that year. There were many trees then to be found in St. Augustine which exceeded 40 feet in height, with trunks from 20 to 27 inches in diameter, and which, probably, were more than a century old. The late Mr. Kingsley left upwards of 6,000 bearing trees, in 1843, all of which were on the St. John's. In addition to these, there were also on the same river more than one hundred orange groves, which, it was estimated, contained 20,000 trees. At St. Augustine, it was stated, there were at least 30,000 standard trees, 4,000 of which were owned by Mr. J. Douglass, about the same

number by Mr. V. Sanchez; and by Mr. J. Drisdale, and the lady of the late Dr. Anderson, 1,500 each. Notwithstanding the injuries which the trees suffered by the depredations of insects, as well as by the discouragement caused by frost, it may be observed that there were more standard trees planted in Florida at that time than there ever had been at any former period. Previous to 1835, St. Augustine produced annually from 2,000,000 to 2,500,000 oranges, which were equal in bulk to about 15,000 barrels. They were shipped to Charleston, Baltimore, New York, Boston, &c., and usually brought from $1 to $3 per hundred, or about $3 per barrel, producing in the aggregate a little short of $50,000 per annum. During the orange season, the port of St. Augustine formerly presented quite a commercial aspect, there being frequently from fifteen to twenty vessels in it at a time, loading with fruit. A person who was the owner of 100 standard trees could safely rely on a yearly income arising therefrom of $2,000, sometimes $3,000, and even $4,000! In 1829, Mr. A. Alvarez gathered from a single tree 6,500 oranges; and it is said that there was a tree on the St. John's which bore 10,000 fruits in one year! But ordinarily each tree produces about 2,000 fruits.

The orange tree, like all its cogeners, under various conditions, has long been subject to the attacks of various diseases, as well as to the depredations of noxious insects. Foremost among the latter stands the "scale" (*Coccus hesperidum*, or some allied species,) which, some twenty years ago, devoured, or rather sucked to death, the orange trees of the Azores, and at one time, it was feared that it would overwhelm all the orangeries on the globe in one common ruin.

This insect first made its appearance in Florida, in Robinson's grove, at Mandarin, on the St. John's, in 1838, on some trees of the Mandarin variety, which had been procured in New York. In the course of three or four years, they spread to the neighboring plantations, to the distance of 10 miles, and were the most rapid in their migrations in the direction of the prevailing winds, which evidently aided them in their movements. In 1840, Mr. P. S. Smith, of St. Augustine, obtained several trees from Mandarin, which he planted on his premises. These trees, unfortunately, were infested with the scale insects, which found their way to others of the same inclosure, rapidly extending themselves to the trees and plantations at the northerly and westerly parts of the city and vicinity, obviously aided in their migration by the southeast winds that blow there almost daily during summer; and what is remarkable, these insects were occupied nearly three years in reaching trees in the southeastern part of the city, only about half a mile from their original point of attack. They have since, however, extended throughout the regions adjacent to the St. John's River, not only on all cultivated trees, but the wild orange groves have suffered equally, and but little difference can be perceived in their ravages on young or old plantations, vigorous or decayed. Most of the cultivated orange trees in Florida have also been injured by them, their tops and branches having been generally destroyed. Their roots and stems, it is true, remain alive, and annually send forth young shoots, only to share the fate of their predecessors.

Whatever may have been the origin or the means of diffusion of the coccus, it is obvious that, having once appeared, the large number of eggs produced by each female will sufficiently account for the rapidity with which it has extended. As the females do not possess wings, it is quite certain that it cannot spread from tree to tree by their flight. By means of their legs, however, the young are capable of locomotion, and as they emerge from their parent shell, hundreds must necessarily fall to the ground, many of which, of course, will take refuge in the neighboring trees. In regard to its transmission from one locality to another, there are several modes in which it may be effected. Any one, for instance, communicating with a tree, or even passing one infested with this insect, is liable to carry with him scores of the minute young, both male and female, unknown to himself, as they are almost imperceptible to the naked eye; probably the same end has also been accomplished by means of large insects birds, and dogs, as well as by the severed leaves of the trees conveyed by winds. That the spread, therefore, of this pest, in Florida, from east to west, has been caused by the transmission of the young females from place to place, there can be no doubt. Various remedies have been tried to arrest their progress, such as dusting the trees with powdered gypsum, lime, wood ashes, soot, flour of sulphur, and Scotch snuff; covering them with white-wash, soft mud, soap, gas-tar, turpentine, or with gum shellac, paste, glue, and other viscid or tenacious substances, mixed with clay, quicklime, salt, &c.; washing or syringing them with sulphur water, gas liquor, spirits of tar, and solutions of Peruvian guano and whale-oil soap; as well as subjecting the trees to the fumes of tobacco, ammonia, camphor, and sulphuretted hydrogen gas—but all partially or entirely failed. The only effectual remedy thus far applied, with the exception of actually destroying the trees, or rubbing or crushing the scales to atoms, is the method adopted by Mr. Gordon, late Superintendent of the Ornamental Department of the London Horticultural Society, by means of hot water, which, it seems, dissolves them at a temperature of 140° to 160° F., annihilating the mother coccus, and her young, eggs included, and this, too, without injuring the bark of the trees on which they feed. It may be applied by a syringe or sponge, simply by bringing the hot water into contact with the scale. It may be urged that if water, at a temperature of 140°, will not injure the bark of the tree, it will its young, tender leaves. Grant it—should it kill them, new ones will come out in their place, so that the worst consequence is only a temporary loss. But, notwithstanding the insect may certainly be destroyed by hot water, wherever it can instantly be brought into contact with the scale, yet there is a practical difficulty in the application of this, as well as other remedies, in consequence of the minuteness of the creature and the facility with which it can screen itself in the crevices of the bark. or in the earth at the foot of the tree. This difficulty, however, might be met by the use of steam, of a proper temperature, applied with a suitable apparatus, which would instantly insinuate itself into every cranny of the bark. Another remedy here suggests itself, so far as known

by me, never tried; that is, the application of the Persian insect powder, or a decoction of the same plant, *(Pyrethrum caucasicum,)* as described at page 129, in the Agricultural Report of the Patent Office for 1857.

From the preceding remarks, it will be seen that the orange planters of Florida have two serious drawbacks to contend against, namely, an occasional severe winter which kills down or greatly injures the trees, and the formidable insects above described. The former, undoubtedly, could be greatly ameliorated by thoroughly under-draining the soil by means of tiles, and the latter by invigorating the trees by high manuring and the utmost vigilance on the part of the cultivator in keeping down these pests to prevent their sudden increase. This tree, it is well known, will bear to be deprived of water during the season of its rest, provided its roots remain undisturbed in the earth in which they grow; and experience tells us that the effect of frost upon plants, in general, is feeble in direct proportion to their dryness, and that they will survive a degree of cold, in winter, when kept in the shade, which would prove fatal to them if exposed to the direct rays of the sun. How far under-drainage and screening the trees from the winter's sun would effect these purposes can only be determined by actual trial.

Although the orange tree is found to flourish well in warm, fertile soils, composed principally of sand and loam, or sand and clay, not too dry, and sheltered from chilly, parching, or ocean winds, it will not continue productive during a very long period without maintaining its vigor and strength by means of manure. At Genoa and Florence, in Italy, this fruit is grown to perfection in a strong, yellow clay, highly fertilized; and in France, in preparing a compost, the gardeners aim to compensate for quantity by quality, as the pot or box in which the tree is placed is always as small as possible, relatively, to its size, in order to avoid too much moisture about the roots. A compost made by the following process, applied in moderate quantities to the small roots of the trees, in November or December each year, either as a top-dressing or forked in, will be attended with excellent effects: To a fresh loam, taken from a piece of ground which has not been cropped nor manured for many years, containing about a third part of clay, a third of sand, and a third of vegetable matter, and which has laid a long time in a heap, add an equal bulk of half-rotted stable manure. In the course of the next year, twice turn over the heap, and the year succeeding, mix it with nearly half its bulk of decomposed horse manure. The winter before using, turn the mass over twice or three times, add one-twelfth part, by measure, of sheep manure, one-twentieth of Peruvian guano, the dung of pigeons, or domestic fowls, and one-twentieth of dried ordure. If the loam is deficient in vegetable matter, it may be supplied by peat earth, or the rotten leaves of trees.

The question of restoring and extending the orange culture in this country is of considerable importance in an economical point of view, as few crops can be made more profitable with the same labor and outlay of capital, as was proved by the results in Florida prior to the

year 1835—another instance of the advantages that would accrue in supplying ourselves with an article of luxury, for which, at present, we depend chiefly on a foreign source.

D. J. B.

INSECTS INJURIOUS TO THE COTTON PLANT IN FLORIDA.

BY TOWNEND GLOVER, OF FISHKILL LANDING, NEW YORK.

The cut worms of the cotton plant, fed in confinement as usual, did not change into perfect insects, as the caterpillars, although supplied with fresh food daily, appeared to languish and die, from some unknown cause, either just before or after changing into the chrysalis. These worms did considerable damage to the cotton when it was in a very young state, cutting off the plants above the earth, and retreating to their holes with the severed plant, which they devour under ground at their leisure. During the heat of the day, these brown, fleshy, greasy-looking caterpillars remain in the ground; and it is only at night, or late in the evening, that they emerge from their burrows to cut off and eat the plants. The chrysalis is about 0.7 to 0.8 of an inch in length, and of a brown color. It is formed under the earth; but, as the moths did not appear, it cannot now be exactly described, especially as the habits of the cut worms are so various and the varieties so numerous, that, until they shall be carefully examined and figured, there is great liability to misapprehension, particularly considering the close resemblance these worms bear to each other.

The cotton-stainer, or red bug, an insect about 0.65 to 0.7 of an inch in length, the males being 0.56, of a red color, with a black mark on the thorax, and upper wings also black, edged and marked across its surface with a cream-colored St. Andrew's cross, was prevalent in the neighborhood of Ocala. It drains the sap from the bolls by its puncture, causing them to become diminutive or abortive; but the principal injury it does is by sucking the juices of the seed and boll, and then voiding an excrementitious liquid, which stains the cotton fibre yellow or reddish, and very much depreciates its value in the market, the stains being indelible. The young larvæ are red, with black spots on the top of the abdomen; the pupa is also of the same color, but has rudimentary black wings. It is only the perfect insect which is able to fly and reproduce its species. The eggs are yellowish, about twenty to thirty in number, and hatch very soon after being deposited. These insects did not appear till very late, in the neighborhood of Palatka, and did no damage; but they were quite abundant at and near Ocala, where information was obtained from which it would appear that they hybernate under trash, bark, or stones. Even in November, numbers were found in the fields perfectly lively after a pretty severe frost; and they are in the habit of congregating in vast numbers, in heaps of cotton stalks, and are also very fond of the refuse of the sugar-cane, after the juice has been

pressed out by the mills. If, therefore, the places be marked out where they abound, and heaps of trash be collected in such places, and mixed with a very little cotton-seed and the refuse from the sugar mills—taking care, however, that none be dropped, except at these heaps, and the ground perfectly cleared in the neighborhood—the insects will naturally flock to such heaps for shelter and nutriment during the warm days, and when so collected may be burnt up in the cold weather, when benumbed by the frost. In the spring, likewise, the gravid females ought to be sought for as soon as they appear, and immediately destroyed; and when the young are first hatched, as they congregate together in crowds, they may be destroyed very easily; whereas, if left to themselves, they would disperse over whole plantations, and form new colonies in every part of the field.

RESEARCHES ON THE COTTON-STAINER, OR RED BUG.

BY CHARLES T. JACKSON, M. D., OF BOSTON.

I received from the Patent Office a small box of red bugs, *(Phyrrhocoris suturellus,)* which infest the cotton plants of Florida, and bore into the bolls, leaving an indelible stain on the fibre. It was supposed that a dye of a red color could be extracted from these insects, since their bodies are of a bright red. Upon examination, it was soon proved that no coloring matter of that kind could be obtained, but that the whole substance of the insect could be converted into a rich orange-yellow dye, which is readily fixed on woollen or silk fabrics by the alum mordant liquor. An ochreous yellow lake can also be made from them by precipitating the coloring matter with gelatinous alumina.

The following are the processes I made use of in forming the dye: A quantity of the insects, placed in a glass vessel and covered with nitric acid, was heated to the boiling point, when they dissolved with much effervescence, nitrous acid gas escaping. When the solution was completed, I added a little water, and dipped white flannel, previously boiled in a solution of alum, into the cold solution, and allowed it to remain a minute. I then dipped the flannel into a weak solution of ammonia in water, when a rich orange was produced. The flannel was next dried and rinsed in water, after which it was washed in boiling soap suds, and the color was found to be permanent. Samples of silk were successfully dyed in the same manner, but cotton and linen failed to fix the color. It is evident that the dye is suitable only for woollen and silken goods, and that it will serve as a yellow basis for green and brown dyes. I colored a sample of the flannel yellow, and then blue, in Prussian blue dye, when a rich green was the result.

In preparing the mordant for woollen goods, about 2 ounces of alum should be added to a gallon of water. They should then be

boiled for a few minutes in this solution. They are next to be dipped into the nitric solution of the insect, after which they are to be soaked in a solution of half a pint of ammonia added to a gallon of water. The proportions are not very important, provided there is more than a sufficiency of ammonia to neutralize the nitric acid in the yarn or cloth.

This discovery of the art of making a yellow dye, of a permanent character, from the red bug, may prove beneficial to the Florida planters in various ways. I think its value, however, is likely to be chiefly local, as the quantity of these insects the planters can collect would not be adequate to the demand. For a home dye, it will be convenient, and perhaps it may be of sufficient importance to export for special use.

IMPROVEMENT OF LAND.

DRAINAGE—ITS HISTORY, PRINCIPLES, AND ADVANTAGES TO THE AGRICULTURIST.

A knowledge of the principles of drainage and irrigation is essential to intelligent husbandry; and the degree of this knowledge to which we attain, and the fidelity and accuracy with which we apply it, will, to a great extent, determine the measure of our success; for since excessive moisture and drought have their alternations in almost every region in which tillage is practised, the skill enabling us to arrest the evils of either is of course alike general in its application.

The origin of the art of removing superfluous water from land with the view of increasing its productiveness may be traced to remote antiquity. In most, if not all the Eastern nations, irrigation and under-drainage, as well as the other most valuable practices in agriculture, were well known, together with the purposes to which they were applied. The modern Persians, for instance, are supplied by means of hollow drains, with water in their most fertile fields, though they know not whence it is brought, and are unacquainted with the arts by which a more ingenious people, in former times, contrived to relieve one part of the soil of its superfluous moisture, and with it to enrich another. The ancient Roman writers, Cato, Palladius, Columella, and Pliny, particularly mention the practice of under-draining, and describe the methods by which it was performed. The drains, they tell us, were filled half way up with small stones, or, for the want thereof, with willow poles, and even with coarse twigs, or other similar materials, twisted into ropes. The heads of the drains were closed with large stones, and the mouths, or out-lets, protected by regular constructions; and the drains were carried to a depth of 3

or 4 feet below the surface. Though agriculture was long honored in the Roman empire above all other industrial pursuits, it fell into disrepute and declined during the dark ages, when petty warfare chiefly engrossed the attention of the European States and labor was regarded as degrading.

The beneficial influence of drainage is not a subject of controversy; but there are conflicting views with respect to the conditions under which it may economically be applied, and the mode of its application; and the questions thus arising must always be determined with reference to the relative value of land and labor, and the cost of transporting produce to market, as well as to other considerations determinable only in the respective localities in which improvements of this nature are contemplated.

It is true that moisture is essential to vegetable life, and that drought is a frequent cause of inferior and diminished products; and a knowledge of these facts causes many persons to oppose the practice of drainage, except upon soils absolutely flooded or surcharged with water. This is decidedly an error. Lands which appear to retain but little moisture often stand in great need of under-draining, as must be manifest to every one who considers that evaporation from the surface is a powerful means of impoverishing the soil, and that the percolation of water through the earth is beneficial in diffusing to the depth of the drains the temperature of the surface, first, by the descent of moisture, and secondly, by the admission of the atmosphere through the interstices thus opened to its circulation.

When water stagnates upon the soil, it decomposes the roots and stems of the most desirable vegetables. Even though it may not remain on a spot during the whole year, its temporary stagnation in warm weather renders the land unproductive. Seasons of tillage are often lost, and in wet years, the crops must be scanty and precarious. The land can only produce the coarsest and most hardy vegetation, such as can resist the chilled or cold state of the soil, or the fermentation which is often caused by sudden warmth while the water remains upon the ground. Hence the importance of draining, by which arable land is rendered manageable, made to dry gradually and early in the spring, and the grain increased in quantity and weight; by which, also, in pasture lands, the grasses are made to change their color and lose their coarse appearance, and the finer kinds are enabled to flourish.

Even the climate may be considerably modified by means of draining, being rendered less cold during the winter, and in hot weather, the exhalations from the soil are diminished, and its salubrity to animal and vegetable life is greatly increased. Thus the various kinds of grain are brought earlier to maturity; disease is averted and the harvest rendered less precarious.

The principles of draining are as various as the causes rendering their application necessary, as, first, when the excessive moisture is occasioned by rain or surface water stagnating upon the land; secondly, when it arises from springs or water in the earth; and thirdly, in cases

of what are called "land-locked" bogs, from their being situated upon lower levels than the adjacent fields.

DRAINING SOILS RENDERED WET BY THE STAGNATION OF RAIN WATER UPON THE SURFACE.

To relieve land from rain water liable to stagnate upon it, two kinds of courses have been adopted—*open drains*, so called from their being exposed to view in their whole length, and *hollow drains*, which are covered so as not to be apparent to the eye, nor any part of the land lost. Hollow draining is sometimes avoided on account of the great immediate expense with which it is attended; and, in certain situations, because it is inadequate to the object in view. It was formerly believed that certain soils, composed chiefly of stiff clay, possessed so great a degree of tenacity as to retain water upon every trifling depression of their surface till evaporation had carried it off; but modern experiment has shown this to be incorrect.

It sometimes happens, however, on ordinary soils, that hollow drains may not be wholly relied upon; as, for instance, where the admission of surface water cannot be avoided, and, from the elevation and grades of the adjoining lands, must be greatly augmented in time of heavy rains. In such cases, a close or hollow drain would be liable to be choked up by the sand and soil brought down by sudden and violent torrents. In these situations, therefore, resort must be had to open channels.

Soils formed of a tenacious clay may be drained by being laid up properly in ridges, high in the middle and with furrows at each side for carrying off the water; and the great art of preserving land of this description free from superfluous moisture consists in laying out every field in such a direction that all the furrows between the ridges may have a gradual descent to a common channel for conveying off the water. Where at any particular spot the regularity of the descent is interrupted, cross-furrows must be kept open with the same view. The ridges must also be laid up in such a form as will allow the water to descend from the summit into the furrows on each side. But if the ridges are too high in the centre, there will be danger in heavy rains of washing the soils into the furrows, which would impoverish the centre of every ridge, choke up the furrows, and render them unfit to drain the land.

The distinguished success of the Flemish husbandmen, and also of the farmers in the central counties of England, where clayey soils abound, sufficiently demonstrates the practicability of preserving it in a due degree of dryness for the most valuable purposes of agriculture. In these countries, the general mode of draining land consists of ploughing it into high and broad ridges, from 20 to 30 and even 40 feet wide, with the centre, or crown, of each 3 or 4 feet higher than the furrows. By attentively preserving these furrows in good order, and free from stagnating water, the land is kept in a dry state, and all kinds of crops flourish.

With regard to the general rule for making open drains, it may be observed that their depth and width must always be left in some measure to the judgment of the husbandman, that they may be varied according to the nature of soils and situations. Upon the whole, the width at the bottom ought not to be more than one-third of that at the top, as by being sufficiently sloped, the sides may be secure from falling in. The declivity should be such as to carry off the water, without stagnation, and along with it any grass and other loose and light substances happening to be in the ditch. At the same time, care ought to be observed to lead the drain in an oblique manner down any deep declivity which may occur, in order that the water may not, by a too rapid motion, wear down the sides and form inequalities in the bottom. In mossy and very soft soils, drains require to be of considerable width, on account of their tendency to fill up; and their breadth at top must exceed that at the bottom in a greater degree than the proportion already named. In all cases in which a ditch is desired, as a drain only, and not to supply the place of a fence, the earth thrown out of it ought not to be allowed to remain when thrown some distance from the ditch, but should be spread upon the land or used in filling up the nearest holes, so that the surface water may not be prevented from reaching the ditch; nor the sides be pressed in by the weight of the superincumbent earth, and the difficulty of scouring or cleaning increased. When it is necessary to use the ditch as a substitute for a fence, a deep furrow should be made along the back of the mound of earth, with openings at convenient places into the ditch for transmitting to it the water collected in the furrow.

In pastures, small and narrow open cuts made with the plough, or otherwise, are often extremely useful, to carry off stagnant water, and a part of the rain as it falls; but they are easily closed by the trampling of cattle. All open drains, however, require to be cleaned out, perhaps, as often as once a year. When this process is neglected, it becomes more difficult, and they lose their effect. Hence, though open drains are originally cheaper, yet, by the necessity of annual repairs, they sometimes become ultimately more expensive than the more thorough kind next to be considered.

UNDER-DRAINING.

Hollow drains, in which the water is allowed to flow along a bed of loose stones, or other materials that are covered with a bed of earth in which the operations of the plough can proceed, bear a near resemblance to that part of the constitution of Nature by which water flows in various channels through porous strata in the bowels of the earth, and, coming to the surface in various situations, supply springs and the constant flow of rivulets, as well as of the largest streams.

If a field proposed to be drained lie on a declivity, great care should be taken to make hollow drains in a direction sufficiently horizontal to prevent a too rapid descent of the water, which might wear

the bottom uneven, and choke, or as it is sometimes called, "blow up" the drain, whereby, in certain spots in the field, artificial springs would be formed.

With regard to the season for constructing drains, discordant opinions are entertained, some preferring winter and others summer; but where much work is to be accomplished, a choice may not be left to the husbandman. Some, however, prefer summer when they have time, as they are then able to execute the cuts in a neat manner, and without that kneading of the soil which would often occur in winter, and which, doubtless impairs the usefulness of the drain, by retarding the water in its descent. It is easier also to bring the stones or other materials to the spot in summer than in winter. Others, however, prefer draining in winter, because, in the case of a clayey soil, the work at that season is more easily performed and laborers are usually more readily obtained.

The depth and width generally adopted for hollow drains are various, according to the nature of the soil and the situation of the field. When the practice first came into common use in Britain, 3 feet was the average depth; but for many years, it seldom exceeded 30 or 32 inches, while in most cases it was but 24 or 26 inches. The rule observed being that the depth must be sufficient to prevent the materials with which the drain is filled from being affected by the tread of horses in a furrow while ploughing. A horse's foot-print in a furrow is usually 4 inches or more in depth. If 10 inches be allowed for the stone or other materials employed in filling, there will remain, in a drain of 24 inches, only 9 or 10 inches to support the foot of a horse exerting his strength in the act of ploughing, which, upon a porous soil, is scarcely sufficient.

But in modern times, the depth of under-drains has been greatly increased. The question of water passing through dense soils is vital to the interests of agriculture. There is something absurd in the assumption that clays are impervions to this element. If it cannot penetrate the clay, how does the latter get wet? We cannot exclude water from a cellar by the use of clay. It is true, that when already saturated, it will hold water on the surface as in a basin, for the reason that, being saturated, it can absorb no more; but when means of escape beneath are provided, the surface water cannot be prevented from sinking. The deeper the drain, or tap, within reasonable bounds, the greater the pressure; and as the water flows out, the air follows from above, just as liquor, flowing out of a cask, requires the vent-peg to be withdrawn. Independently of capillary reasons why deep drains act best, we must consider that the deeper they are, the nearer to a perpendicular will be the descent; and we know that water will rush quicker down a steep hill, than down a gentle slope. It may also be said in commendation of deep drains that they run longer, and discharge more water than shallow ones, for the obvious reason that 5 feet of earth will absorb more water than 25 feet, on the same principle that a cask 5 feet deep will receive twice as much water as one of only 30 inches. Deeply drained land will not, after dry weather, discharge water so soon as that which is shallow

drained, nor, indeed, will it run at all after the first light autumnal rains, which are only sufficient to moisten so deep a mass of earth. But when the soil is charged with water in winter and spring, the deep drains begin to run rather sooner than the shallow ones, and continue much longer. The water is more pure and clear from them, also, as it is better filtered.

Again, open ditches in strong clays do not under-drain the adjoining land, as has been proved by a ditch which had pipes put into it, and was then filled with earth, when it discharged more water than previously from the adjoining field. This may be explained from the fact that the capillary power exerted at the sides of the open ditch was stronger than the force of gravity.

With regard to the materials with which drains are filled, not only stones and broken bricks, but also wood and other substances have been used. Upon this point it has been stated that drains filled with wood and covered with straw or rushes, are preferable to stones, the reason assigned being, that as the wood decays the water continues to run. When filled with stones and the drains stop, which must be expected to take place in time, the earth becomes quite solid round the stones, and as they do not decay, the filtering of the water is obstructed. Not so when bushes or wood are used.

Another method of constructing hollow drains consists in the use of straw ropes, about the size of a man's arm, which could be cheaply manufactured in regions where wheat is extensively cultivated. These ropes should be twisted by machinery so as to contain no irregularities or knots. When covered to a proper depth at the bottom of drains, they have been known to last thirty years, serving well the purpose for which they were designed.

In connection with this subject may be mentioned an invention made in England many years ago, which consisted of a cast-iron wheel 4 feet in diameter, weighing 400 or 500 pounds, the cutting edge or circumference being half an inch thick, increasing in thickness toward the centre. This wheel was so arranged in a frame as to be loaded at pleasure with stones, and made to operate at a greater or less depth, according to the resistance of the ground. It was used in winter when the soil was soft, and the grooves made thereby immediately filled with small straw ropes or twisted twigs, covered with earth. These grooves, or drains, were usually 15 inches deep, half an inch wide at the bottom, and 4 inches at the top. Thus marshes or wet meadows were drained at small cost. It is stated that 12 acres could be fully gone over with this draining wheel in a day.

But the most thorough drainage, and probably the most economical in the end, is the system at present adopted in England and some parts of the United States, in the use of burnt clay tiles, described at page 176 of the Agricultural Report of the Patent Office for the year 1856. The size of the tiles, or drains, should be regulated by the quantity of water. Small pipes, if not too small, will continue open better than larger ones, especially as rats or other vermin are less liable to enter them. Besides, economy forbids the use of larger pipes than are requisite. As to the form of these, where large drains are

needed, the sole-tiles may be regarded as the best; but where a small quantity of water is to be discharged, calling for a tube of say 1½ or 2 inches in diameter, pipe-tiles may be adopted, and secured in position by means of collars made of the same material as the pipes themselves. It has often been asked, when the joints of the pipes are thus covered, "How can the water get into the drain?" Any one who has ever made the experiment of gently pouring water upon a new brick, not over burnt, will readily understand how the water would penetrate a burnt clay pipe. The reasons given in a preceding paragraph for the permeation of water through stiff clays, as well as in the case of the closing of an open drain, after the insertion of a tile, will serve to elucidate the manner in which this effect is produced.

The following account of the manner of drainage on the farm of Robert J. Swan, of Fayette, Seneca county, New York, is condensed from a Report published in the Transactions of the New York State Agricultural Society for the year 1852, and for which the first premium was awarded. After describing the farm, generally, it proceeds:

The benefits derived from draining this soil, by a thorough and judicious system, were too strongly marked on an adjoining farm to escape notice. The crops of wheat, corn, and clover proved clearly that thorough draining had increased both quantity and quality. To participate in these advantages, it was determined to carry out the system of thorough draining, and operations were commenced by opening trenches in August, which were continued until the first of December. During this period, 72,550 tiles were laid in trenches varying from 2½ to 3 feet in depth, the tiles being 15 inches in length. The whole extent of drains made was 5,496 rods, or 17 miles and 56 rods. Of this distance, about 40 rods were laid with double tiles. A large proportion of the tiles used, however, were of the horse-shoe pattern, with a two-inch rise; a proportion of one-inch pipes were also laid, the whole cost being $670, equal to about 12 cents per rod. The cost of preparing the trenches was 12½ cents per rod, and the expense of laying the tiles in them and filling the trenches was 3 cents per rod. The drains were laid in nearly parallel lines, from 30 to 40 feet apart, conducting the water directly from the highest to the lowest parts of the farm. At the bottom of the drains, or at the depth of 30 to 36 inches, there was a hard compact bottom, on which the tiles were laid, no other preparation being necessary.

It may be here remarked, that, from the natural declivity of the fields, the water did not often appear on the surface of the ground, yet the excess of moisture, even on the highest situations, almost every year destroyed portions of the crops by winter-killing or freezing out.

In the year following, (1851,) 16,000 tiles more were laid, which, with the quantity used in 1852, completed the drainage of about 200 acres.

An important feature was particularly discernible in the reclaiming of 24 acres of soil which had never been tilled, producing only coarse aquatic grasses, unfit for pasture or hay. This portion of the farm had hitherto been charged with the interest of cost, and also taxes, without any return.

The economy of draining land thoroughly, so far as relates to construction, may be better understood by the following figures:

Cost of digging trenches, per rod	$0 12½
Average cost of tiles, per rod	0 12
Cartage of tiles from the kilns, at 72 cents per 1,000	0 01
Laying the tiles and filling trenches, with ploughs	0 03
Cost of drains complete, per rod	0 28½

Since the above statement was submitted, the residue of the farm has been drained upon the same plan.

D. J. B.

PREPARATION FOR A GOVERNMENT PROPAGATING GARDEN AT WASHINGTON.

In connection with the introduction of the tea-plant from China, and the extension of the vine-culture in the United States, it became necessary that a suitable place should be provided for the propagation of the seeds and cuttings, preparatory to transplanting them to the localities where they are finally to grow. A portion of the Public Grounds in Washington City, situated on Missouri Avenue and Four-and-a-half and Sixth street, containing 5 acres, was accordingly chosen, thoroughly under-drained with tiles, and a hot-house erected on approved principles. The site orginally formed a part of the marshy bank of the Tiber, and nearly level with the ordinary full tides of the present canal, which runs east and west within about 50 feet of the southern boundary of the contemplated garden. In the course of neighboring improvements, this lot has been graded to a height of some 4 or 5 feet, with the excavations from the canal, city refuse, and other incongruous materials. From the porous nature of this newly-made soil, and its proximity to the canal, it readily became surcharged with moisture, so much so that it was unfit even for ordinary gardening purposes; consequently, to adapt it to the object in view, it was necessary to resort to under-drainage. Accordingly, early in August, 1858, a main trunk of a foot capacity, made of plank, (*aa*, Pl. II,) was laid down, some 4 feet below the surface, having a descent of 2 inches to 100 feet, and leading into the canal. At right angles to this trunk, earthern tile drains (*bb*, *bb*, *&c.*,) were inserted at the distance of 33 feet apart, parallel to each other, to a depth of 3 or 4 feet, (Fig. 1,) communicating with the wooden trunk, as indicated by Fig. 2, (*aa*,) having also a descent of 2 inches to 100 feet. The success of this drainage was immediate, and rendered the field perfectly tillable, which was sown broadcast with Chinese sugar-cane, a bushel of seed to the acre. In October following, the crop was cut, just as the seed-heads began to appear, yielding, when dried, about 2 tons to the acre. A portion

of this was used, during the past winter and spring, as a decomposing material for warming the hot-house referred to above. In watching the effects of the drainage during the past winter and spring, it was observable that the field soon became sufficiently dry for ploughing after the heaviest fall of rain, and even the lines of the drains were distinguishable from other parts, in a few hours, while those portions of the ground not drained, indicated by *c*, allowed the water to stand on the surface for several days.

In order to carry out the present enterprise, as well as other utilitarian objects contemplated by the Patent Office, some definite plan of further improving and laying out these grounds was considered necessary. The accompanying design, Plate III, was submitted, and so far as the work has progressed has been adopted. The letters *aa*, *aa*, *aa*, denote propagating houses; *bb*, *bb*, &c., beds proposed to be planted with deciduous-leaved trees, shrubs, and vines, preparatory to their removal to the localities which they are finally to occupy; *cc*, *cc*, &c., beds to be planted with coniferous trees for similar objects; *d*, dormitory for gardener, with apiary above; *e*, entrance gate from avenue; *f*, fountain and aquarium; *gg*, a continuous trellis, exclusively for native grapes; *hh*, evergreen hedges, of various forms, for protection against sun and wind of delicate shrubs and plants.

Owing to the feeble vitality of the tea seeds, after so long a voyage as that from China to this country, the uncertainty of the period at which they would arrive, and the shortness of the growing season in the Middle and Northern States, it was deemed necessary that at least two propagating houses should be constructed, in such positions and on such principles as would afford an indoor climate adapted to their speedy germination and final development. A glazed structure, 101½ feet in length, 25 feet wide, and 11 feet high at the apex, was accordingly erected, in November last, running north and south, so as to receive the natural effects of light in the morning and evening, but screened during the middle portions of the day by sections of opaque roof from the intense rays of the sun. This house, instead of being warmed by fires, hot water, or steam, is so arranged as to maintain a temperature, degree of moisture, and ventilation, during the colder months of the year, suitable for propagating all half-hardy trees and plants, from seeds or otherwise, by means of decomposing vegetable matter, covered with a due proportion of nitrogenous materials. In referring to Fig. 1 in Plate IV, *aa*, *aa*, denote alleys; *bb*, *bb*, *bb*, *bb*, *bb*, *bb*, beds containing decomposing substances for warming house, underlaid with sole-tiles of burnt clay, communicating with each other and with the alleys *aa*, *aa*, *aa*; *cc*, underground caverns, or pits, filled with decomposing materials and leading into the tiles within the house. Fig. 2 shows a transverse section of the alleys *a*, *a*, *a*, of the beds *b*, *b*, *b*, *b*, and the arrangement of the tiles, with the posts, collar-beam, rafters, and scuttles for ventilation above. The beds are separated from the alleys by brick-work, capped with wood. The superstructure of the building also rests on foundations of brick-work, with the north end built of brick. The longitudinal sills, which are of wood, are perforated with holes at intervals, to facilitate ventilation, which

can be opened or closed at pleasure. On each side of the upper part of the roof, there are twelve ventilating scuttles, which can be opened and shut as occasion may require. To avoid the scorching effects of the sun on the young plants, during the hotter months, the house at present is lined with cotton cloth, that of the sides being much thinner than that under the roof.

This propagating house was first brought into requisition in January last. In order to generate a suitable temperature, the beds were commenced by filling on the tile-work to a depth of about a foot the dried stalks and leaves of the Chinese sugar-cane, cultivated on the grounds the preceding year. A layer of fresh horse manure, some 10 inches thick, was then deposited on the stalks and leaves, thereby completing the beds as indicated by *b*, *b*, *b*, *b*, in Fig. 2, Pl. IV. After allowing the materials to ferment for about three weeks, so as to liberate a considerable amount of ammonia and other gasses pernicious to vegetation, the house was ready for trial. It was observed that it was free from unpleasant odors, and from the middle of February to the end of May, a temperature was usually maintained from 70° to 75°, F., sometimes as high as 90° in the middle of warm, sunny days, but never lower, even at sunrise, than 55°. Waiting for the arrival of the tea seeds from China, considerable quantities of the seeds of El Paso grape, Virgilia, cork, and other trees, as well as the cuttings and seeds of several varieties of grapes, were planted in boxes, placed on the beds. With due attention to watering and ventilation, they all speedily germinated, and in a few weeks, had grown sufficiently large to be transferred into boxes or pots, and subsequently removed out of doors, where they continue vigorous and in a healthy condition. On the arrival of the seeds of the tea-shrub, and of other Chinese products, brought in Wardian or glazed cases, at the end of April, they were found to be in excellent order, a large portion being well germinated, and in a fit state for immediate planting. In the meantime, some two hundred wooden boxes, 4 feet in length, 1 foot wide, and 8 inches deep, perforated at the bottom, and several thousand three-inch earthern flower-pots, were provided, with dry proportions of brick-dust, sand, leaf-mould, peat-earth, and field-mould taken from near fences, composed chiefly of rotted grass, roots, and leaves, for the reception of these seeds.

Rude floorings were first laid, extending from the central alley each way to the edges of the side-beds, upon which they rest, the entire length. Successive rows of the flower-pots were partially filled with fragments of pottery, oyster-shells, or brick, and then completely so with a mixture, in the following proportions:

	Parts.
Brick-dust	1
Sand	1
Peat-earth	1
Leaf-mould	2
Loam	4

A single tea seed was planted in each, and the pots were compactly

placed over the entire floors. A tier of the boxes was next arranged, on a level, across and over the entire length of the side-beds, with one end resting on a sill of the house and the other on the edge of the flooring just described. They were filled with fragments of oyster-shells or brick to a depth of about an inch, and then nearly full with a mixture of the sand, brick-dust, leaf-mould, &c., above named, each planted with tea seeds, at a depth of about one-fifth of an inch, and a distance of about 2½ inches apart. As the seeds of this shrub, in germinating, throw out their radicles and plumulæ at the same time, due care was taken to place the radicle downward in planting, and when sufficiently advanced, the plumula partly above the earth. Immediately after planting, the pots and boxes were daily watered at night and morning with rain water collected from the roof of the building, when obtainable. The young plants promptly appeared, after which the waterings were less frequent. Up to the present date, (May 20,) they are gradually progressing, and the experiment thus far bids fair to be crowned with success.

By the establishment of a garden like the one herein proposed, at least a million of young vines or other plants could be propagated in a year, and distributed in such parts of the country as occasion would require.

D. J. B.

PROPOSED IMPROVEMENT IN PRAIRIE FARMING.

[COMMUNICATED.]

To prepare the soil for its greatest productiveness, and to preserve it in that condition with profit, is the highest and noblest achievement of the agriculturist. In order to accomplish this object, the writer presents the following course, which, if adopted on a majority of our prairie farms, he believes, would result in permanent success.

The arable prairies of the West, as found by those who first cultivated them, were so rich and fertile that it was supposed they were almost inexhaustible, and consequently a reckless course of cropping has been pursued, so that for the last two years, retribution begins to show itself in a partial failure of the products of our fields; and this erroneous and improvident course, if not checked, will prove a withering bane to our prosperity. Shallow ploughing, or the "cut-and-cover" system, has become too much the rule, and thorough cultivation the exception. The skimming over of large fields, and obtaining scanty returns, has so prevailed that our farms already begin to suffer the penalty of insect ravages, rust, and blight, all of which find an easy prey on the crops that faintly struggle from an impoverished soil.

The eagerness to work too much land and to possess unreasonably large farms, has been another cause of preventing the owners from enjoying real benefits. But true farming does not consist merely in obtaining the largest yield in a single year, but in cultivating in such a manner as to enable the land to continue to produce from year to year the most remunerative crops; to maintain the soil in its pro-

ductiveness so that the present shall not rob the future. In illustration of this, there would be no credit awarded for shrewdness to the man who should do a large business, make splendid expenditures, and be a "fast-living" man, while constantly drawing upon his principal and annually exhausting his capital. Such a proceeding would be regarded bad management; and yet it really is no weaker than the course pursued by the farmer who yearly impoverishes his lands, by constantly cultivating the same crop, without returning the necessary ingredients to keep up a productive capacity. Either of these courses would soon lead to hopeless bankruptcy.

In pursuing this course, it is believed that the first error is committed in the common mode of "breaking up" the soil. The prevailing custom on our prairies is to cut very shallow, only 2 or 3 inches deep, under the conviction that the turf, or sod, will rot the sooner from being thin. But this is a mistake. From several trials made by others, as well as by myself, we have proved that it is better to break the prairies at the first ploughing deeper, say 5 to 6 inches. By so doing, we obtain at the surface a soil which is much heavier and stands better the drought, and which is not moved by the frost, nor blown about by the wind. Deep ploughing also renders the earth mellow, which is favorable for a greater and deeper spread of the roots of the plants, admitting, at the same time, a freer rise of moisture from below. A team of an equal strength can also plough at this depth as easily as when the furrow-slice is cut only 2 inches deep; for, although, at this greater depth, there is more friction, the toughness of the sward, or grass roots, at a shallow depth, presents greater resistance. Another advantage to be derived from deep breaking up is that the ground can afterward be ploughed more easily and to a greater depth. Besides, the increased fertility of the soil and the depth to which the roots of the plants can penetrate, will admit of a greater number of crops before manuring or sub-soiling is required. Hence deep breaking up is the first operation in judicious tillage, which should be succeeded by deeper ploughings as often as every third crop, in every rotation, and after each seeding down to grass.

With regard to the time of breaking up, it does not much matter at what period of the year it is done; as, when thus smothered deeply under, a turf will soon rot, which is not so in shallow ploughing; for, in that case, it must be done in warm weather, when it is necessary for the sun and moisture to decompose the roots to insure decay. Another important consideration in deep breaking up consists in allowing the work to be performed in cool weather, when teams can work to more advantage than in summer heats.

From the best data at command, it appears that winter wheat or rye will generally afford the best return to the farmer as a first crop on deep summer or fall ploughing, as in that condition the prairie soil is in the best state for these crops, particularly if the seed is thoroughly put in with drills so as not to "heave out" and become winter-killed. With this treatment, by covering deeply the seed, these crops will almost uniformly succeed. In truth, it is only with deep breaking up

that a winter crop can be relied upon, for then there is a good consistency of earth turned up to cover and receive the seed.

If the ground is broken up in the fall for corn, it should be thoroughly harrowed the following spring, just before planting; and then the seeds should be dropped in a good furrow instead of in the common shallow marking, which would give the young plants a safe bed for early growth. As soon as the corn is fairly up, say 2 or 3 inches high, it should be well harrowed or dragged, taking out two or three teeth from the harrow, so as to stride the rows without injury to the plants. This pulverizes and levels the earth better than either cultivator or hoe, throwing a little loose earth around the young plants to protect them, and to retain the necessary moisture. In the after-working with the cultivator and hoe, no hills nor hummocks will be left to interfere with the subsequent tillage. Besides, the tall thrifty stalks of corn stand firmer than in the peaked up hillocks of the old-fashioned mode, which drains off from the plants the rain that is needed to support them.

It is a well known fact to those who have experimented in the matter, that corn is generally planted further apart than is necessary. Three feet between the rows is quite enough, which admits of all the required circulation of air, and the influence of light, and affords sufficient space for a hoe and cultivator to work them; 18 or 20 inches between the hills, in the rows, is enough, as the roots cannot reach the substance of the soil at a greater distance. Hence, if the soil be rich, clean, and in good condition, a greater yield will be the result.

At the second ploughing, the following year, the furrow may be cut an inch or two deeper than the original breaking up, and with a reasonable manuring in the fall, a crop of winter wheat or rye may be put in, which will produce almost to a certainty a large yield. And here I may remark that there is too little attention paid on our prairies to the raising of rye, a grain which does not seem to be fully appreciated, as it is both wholesome and nutritious, and may be cultivated with a degree of safety where the wheat-crop might fail, thus prudently fostering a larger variety of crops.

After a third thorough ploughing, a winter crop may be profitably followed by oats, and seeded down with Timothy and clover, in the spring, either of which would furnish a good pasture for cows, after harvest late in the fall. The following winter, while the ground is hard, a top-dressing of manure may be applied, or of plaster, in the spring. By the middle of July, this meadow will yield 2 tons of good hay to the acre; and from the middle to the last of September, another ton, furnishing a luxuriant pasture for a month or two longer, or until the ground is covered with snow. In this view of the subject, top-dressing with manure or compost is much more important than is generally supposed, not only increasing the richness and productive capacity of the soil, but preserving the freshness and moisture by warding off the hot summer sun. The grass is also brought forward early in spring, and consequently is more speedily carried beyond the reach of drought. It has a similar effect, and is alike useful, as mulching has around newly-transplanted trees, and its

value can hardly be overrated, when it is properly attended to; for while it thus retains the moisture, it absorbs the ammonia about the plant, preventing its escape by evaporation.

Meadows, like other crops, may be the "stouter" from deep ploughing, because the ground everywhere suffers less from drought, as it more readily allows the moisture to rise freely from below; while it equally benefits wet lands, by affording the escape of surplus water, both by drainage and evaporation, and imparting warmth to the soil.

The winter before it is intended to turn over the sward of a meadow, for a grain crop, it should have a heavy top-dressing of stable manure, which would be all the better for composting with a mixture of leached ashes, lime, plaster, charcoal-dust, and marsh muck, the latter well slacked by freezing. It may here be remarked that this ploughing should be run a little deeper than the former furrows. As a general rule, there is but little danger that any one will manure too highly, or with too great a variety of fertilizers, if they are only well mixed, though a free application of fresh stable manure would often injure vegetation, and if mixed only with wood ashes, soda, or lime, it would loose a larger share of its ammonia. The swamp muck, or peat, when thus composted, will be found to be of the greatest benefit to our farmers, as the marshes and swamps, which abound in these regions, furnish inexhaustible mines of wealth. When ditched, they form good meadows, and cords of the best fertilizers are thrown out, so that our farmers, who have access to them, can enrich their fields, and need not be under the necessity of purchasing costly guano, or other manures, if, at half the expense, they would use this muck. The success which the farmer attains in raising good crops depends much upon the character and quantity of the manures he employs. This is second in importance only to a judicious system of rotation and deep ploughing.

The best course of rotation for various crops on the prairies may be briefly stated as follows—assuming a farm of 80 acres to be in a wild or natural condition, and cropped consecutively as fast as two men and a good team can work to advantage, I would lay it out in ten-acre lots, adding a new field each year, separating them by fences as fast as my pecuniary means would admit, with the farm buildings, yards, grass-plat, garden, orchard, and grove to occupy one of them. Then, after breaking up sufficient ground for a kitchen garden, Sorghum, potatoes, sweet corn, &c., I would commence a diary, with a separate page for each lot and crop, and proceed as far as practicable with the rotation, until all the lots in turn had reached the climax of seeding down to grass:

FIELD No. 1.

1*st Crop.*—Commence in spring of 1860. Break up deep and plant a portion with Indian corn and spring wheat, the latter drilled in. For convenience, in starting a new farm, put in two or three varieties of grain, to supply the wants of the family and stock.

2*d Crop.*—In autumn of 1860, plough deep the recent corn ground,

and sow with winter wheat; and plough the late spring wheat stubble, and sow in winter rye. In the autumn of 1861, harvest the above, spread light manure, and plough deep for next summer's crop.

3d Crop.—In spring of 1862, put in corn and roots.

4th Crop.—In autumn of 1862, sow winter wheat and rye, drilled in after thorough ploughing. In 1863, harvest the last two, add more manure, and plough an inch deeper than the year preceding, furrowing into beds, or ridges, 50 or more feet wide, so as to drain the surface, in readiness for the crops of the next summer.

5th Crop.—In the spring of 1864, sow oats and barley, and seed down with from 10 to 12 quarts of medium red clover to the acre, smoothly dragging, or rolling the field to make a good bottom for future mowing.

Thus we have gone through with one of the ten-acre lots, obtaining five good crops, and seeded down to clover, and the soil is yet rich and strong. In the mean time, other ten-acre lots have been broken up.

In the fall after the oats and barley are harvested, the clover field will furnish excellent feed for calves, rendering them in fit condition for winter. By giving it a moderate top-dressing each winter, or a liberal scattering of plaster every other spring, with top-dressing in the intermediate winter, it will be profitable as a meadow and fall pasture for at least three or four years. I would sow clover only on the first, and occasionally on other fields, for the purpose of saving seed; but simply for hay and fall pasture, it is well to mix with Timothy, which also makes better hay.

In case I arrived on this new farm too late to break up and put in a crop in the spring of 1860, as above, I would begin in the fall of that year, just where our new rotation would bring us with a second field. For instance, if I commenced in the spring, No. 1 in this order would take the place of No. 2, in the following order:

FIELD No. 2.

1st Crop.—In the autumn of 1860, break up deep and sow winter wheat and winter rye. In 1861, harvest the above and plough in autumn an inch deeper than before for corn and oats, or roots, the next summer.

2d Crop.—Put in corn and oats in spring of 1862.

3d Crop.—Sow in autumn of 1862, winter wheat and harvest the following year. In autumn of 1863, spread manure and plough for next summer's crop.

4th Crop.—In spring of 1864, put in corn and spring rye; harvest in autumn, and plough deep.

5th Crop.—In autumn of 1864, sow winter wheat and seed down with Timothy, from 8 to 10 quarts to the acre. As might be the case, should there not be time to put in this fifth crop, let the ground be manured, and thoroughly ploughed and dragged for a growth of spring wheat early in 1865. As soon as the ground is sufficiently dry, in the spring of that year, drag well and smoothly; sow the wheat with

from 8 to 10 quarts of Timothy; drag again, and another meadow is started in a similar manner as with the clover field, named above, after five good crops have been obtained, the land being preserved in its full or improved strength. This meadow, with a moderate top-dressing of fine manure or compost, each succeeding winter, will afford a heavy cut of hay, and a good fall pasture, and continue at least two years longer than the clover field without ploughing. Except, occasionally, however, for saving seed, I would always seed down with clover and Timothy mixed, with about 6 quarts of the former and 4 of the latter to the acre, as it makes a superior quality of hay, in greater demand, and better suited to all kinds of stock. It is also less liable to lodge in the field.

In a similar manner, I would proceed with the other seven ten-acre fields—breaking up two of them each year, one in spring and the other in the summer or fall, until they should all be brought under this order of rotation; and then I would have at least two fields waving with beautiful crops of each kind every year, on lands fruitful and in high tilth, and so maintained. The crops would be produced and secured at less cost than the expense of small yields with poor farming.

It has been determined by experiment, in different places, and on soils no better than those possessed by many of our farmers, that wheat is capable of producing, profitably, from one hundred to one hundred and thirty-fold; that is, 100 bushels from a bushel of seed, by proper sowing and thorough cultivation. These experiments are highly valuable and instructive, as they prove the great capacity of the fertilizing elements with the seed under favorable circumstances to increase greatly the product. Our farmers have generally been well satisfied to obtain from 25 to 30 bushels to the acre, and, as they usually sow 1½ bushels on that space of ground, their yield, in fact, does not exceed twenty-fold.

In order to secure the most profitable returns to the farmer, the fields, as we have seen, should be of moderate size, and proportioned to the whole area. For instance, on a farm of 160 acres, (a quarter section,) the arable fields should not contain more than 10 acres each, except in cases where a large number of animals are kept; and even then, perhaps, these fields would be extensive enough. In general, they admit of a better and greater variety of crops, which would have a tendency to secure a more efficient rotation. Besides, they would afford a more desirable pasture to various kinds of stock; for, to feed profitably, animals should not have too wide a range in rich pastures, as in such cases, they would spoil, by poaching or treading down, nearly as much as they would eat. Nor should the pastures be too long fed by one class of animals, as, in this case, they would feed down some portions of the grass too close, and leave others to grow so rank and ripe as to be unfit for forage; but if the pastures be changed, at short intervals, and grazed by different animals, the whole would be properly cropped off—some eating what would be rejected by others, according to their different appetites and tastes, all thriving, and nothing wasted. Again, by having the stock occasionally removed

for a short time from each lot, the grass would take a new start, affording fresh pasturage upon which the animals could be returned, while other fields were undergoing a like restoration. Thus, under systematic management, both stock and pasture would thrive. Horses, cattle, and sheep have each their peculiar wants and tastes, and should be supplied accordingly. Were a practice like this observed, our farmers would not be so liable to neglect any part of the management of their farms, as is too apt to be the case in large fields.

Several kinds of portable fence have been invented, which might, from their cheapness, light structure, and facility of transportation, be advantageously employed for inclosing small pastures and fields. As these fences can be readily removed, with little expense of time and labor, a chosen number of cattle or other animals could be confined to a pasture of a given size for one or more weeks, and then changed to another, without the usual amount of investment in fences, incident to most of our farms. Besides, as the cattle, sheep, &c., could be kept within smaller limits until the grass is sufficiently devoured, they would better enrich the ground.

Where good pastures are not convenient or bountiful during dry seasons, I have no doubt the system of "soiling," or feeding green crops to the animals in inclosures or stalls, could be substituted with advantages, especially where it is desired to feed the largest number from a given amount of land. This could be accomplished by sowing, and repeatedly cutting when green, the fodder, through the season. Various plants have been used for this purpose, such as Indian corn, millet, rape, &c.; but now it is well established here that the Chinese sugar-cane is the best for this use. It grows rapidly, and as soon as the seed-heads appear it is quite sweet, nutritious, and much relished by cows and other stock, greatly promoting the quantity and richness of the milk.

In the preparation and preservation of the soil, no products, probably, which the farmer can raise, will have a better effect, or afford a greater profit, if properly managed, than various root-crops, particularly beets, carrots, parsnips, and turnips, and none less impoverish the land, for the two following reasons, namely: first, they derive a larger proportion of their substance from the atmosphere than the Cereals, by presenting a greater surface and absorbing capacity in the leaves; and, second, their roots extend deeper into the earth, particularly parsnips, carrots, and beets, and draw more sustenance and moisture from below. Hence they may be regarded as effectual sub-soilers, which leave the ground after harvest in a mellow and improved condition; while they are invaluable as a healthful food for stock, especially in winter and spring, when they modify the effects of too much dry feed, in the absence of grass and other green crops. In mellow lands, these roots will naturally run deeper than the plough can conveniently go; and, while harvesting, by cutting off the lower portion of their tap-ends, and allowing them to be left in the ground to rot, the effect would be to increase the richness, moisture, and permeability of the sub-soil—benefits which could be produced by no other crops, except sainfoin and lucerne.

In conclusion, I would guaranty to any farmer that, in at least four years out of five, he can add from a third to a half to his crops, if he will plough from 1 to 3 inches deeper than usual; annually increase the amount of manure applied to his lands; allow no two successive crops of the same kind on the same field, and faithfully put in the seeds with drills, or by some other mode which will cause them to be uniformly distributed and properly covered. Then let no forage, as hay, straw, stalks, &c., be sold, but retained as manure after being fed to the animals upon the farm, and to sell nothing but the most concentrated and valuable parts of the product, as grain, meat, and wool, thus carrying out the first and highest principle in political economy, which is, to employ profitably the greatest possible amount of labor and expenditure on the smallest area of land.

CHEMICAL ANALYSIS OF TOBACCO SOILS—ANALYSIS OF THE ASH OF THE TOBACCO PLANT.

BY CHARLES T. JACKSON, M. D., OF BOSTON.

In accordance with instructions from the Patent Office, I obtained specimens of the surface and sub-soils from remarkable districts, where tobacco is cultivated, in the States of Maryland and Massachusetts, and submitted them to thorough analysis, for the purpose of ascertaining the proportions of ingredients in the soils which are appropriated by this product, as shown by the analyses of the plants cultivated on the same soils.

The method of obtaining the samples was by driving tinned iron tubes, open at both ends, 2 inches in diameter and 20 in length, into the ground, so as to cut out a section of the surface and sub-soil to the depth of 20 inches. The tubes were then withdrawn, sealed up, and marked, the upper and lower ends being designated by marks on the tin. They were afterwards sawed into two equal lengths, the upper portion containing the surface soil to the depth of 10 inches, and the lower 10 inches of the sub-soil to the depth of 20 inches. All the samples were collected in fields where the tobacco crops had recently perfected their growth, and care was taken in the selection of fair average samples. The localities from which the samples were taken were those directed in my instructions, and are remarkable for the great difference in the character of the tobacco raised, that from Maryland being a fine-flavored variety, but not so large as that grown in Massachusetts, which is extensively employed in making wrappers for cigars; the size and thinness of the leaves rendering it particularly valuable for that purpose.

In Maryland, the soil and tobacco grown therein were selected near the village of Upper Marlborough, in Prince George's county, by Mr. D. J. Browne, of the Patent Office. The fields from which they

were taken had been cultivated many years with red clover, which was ploughed under in a green state, alternated with crops of tobacco and Cereal grains.

The Massachusetts samples were collected by me in the towns of Whatley and Hatfield, on the borders of Connecticut River, from the terrace, which is about 30 feet above the level of that river, and is not subject to overflow from freshets. These alluvial soils are remarkably fertile, producing from 2,000 to 2,500 pounds of tobacco to the acre. Manure is not directly employed for this, but is prepared for it by raising corn, oats, rye, potatoes, and grass, in previous rotations, and afterwards the tobacco is planted, several crops being taken before the land is laid down again to grass.

It is evident from the analysis of tobacco, that it is a great exhauster of the mineral salts, and from a comparison of these analyses with those of tobacco ashes, the planter may at once be able to estimate the capability of the soils, and to see what ingredients he must add to an exhausted field to replenish it. Such results may certainly be attained when we have a sufficient number of exact analyses of plants and the soils as will enable us to decide what are the essential mineral ingredients of plants, for it does not follow that all the mineral matter found in a succulent plant, like tobacco, are absolutely necessary to its growth, as any soluble salts may be absorbed by such plants, and some may be appropriated while others are again excreted. Indeed, we have proof in the analysis of tobacco ashes that one saline ingredient may to a considerable extent replace another, without any known alteration of the healthy character of the plant. What the limits of these substitutions may be we can only know by making a long series of analyses of the same varieties of plants grown on peculiar soils, or on such as are artificially prepared for the experiments.

The analysis of soils is so difficult and requires so much time, that the chemist is often discouraged, and if paid for by the planter, it would cost more than he could well afford. Hence, trustworthy analyses must be made at the public expense, under direction of the Government. The manner in which the present analyses have been executed demands from twenty to twenty-five days, and no chemist can properly attend to more than one analysis at a time. I state this to correct erroneous impressions on the subject. In determining the ingredients of a soil, we have to work on a great number of its separate portions, sometimes employing 100 grains in the analysis, and at others 25, while to separate those ingredients which occur sparingly, we employ at least 1,000 grains for each determination. The results are subsequently reduced to per-centage in the tabulated form. In the first place, the sample has to be dried, at a moderate temperature, in a current of dry, warm air, and then thoroughly mingled, so that the successive portions taken for analytic processes may be exactly alike. To determine the amount of organic matter, 100 grains dried at 212° F. are burned in a platinum crucible, when the loss by combustion and volatilization is ascertained by the decrease of weight. Then the soil is digested with chlorohydric acid,

the matters soluble in the acid are ascertained by the usual method, and their proportions stated. Another sample of 25 grains is next taken for analysis by entire solution, and this is decomposed by fusion with carbonate of soda, in the manner employed in the analysis of insoluble silicious minerals, and a complete analysis made, all the ingredients being weighed, excepting the alkalies, which are determined by difference, while their relative proportions are ascertained by the analysis of the solution of 100 grains of the soil by acids, and then their ratios are computed for that portion which had been analyzed by fusion with soda. Again, separate portions, of 100 grains each, are employed for the determination of the proportions of carbonic and of phosphoric acids, the first acid being ascertained by expelling it, by means of a stronger mineral acid, in a proper apparatus. The phosphoric acid is thrown down from an acid solution, in combination with peroxyde of iron, lime, and magnesia, all of which are precipitated by ammonia. The weight of these substances combined is first ascertained, when they are all re-dissolved, and the oxyde of iron is separated, in the state of sulphide of iron; which is again converted into peroxyde of iron, by nitric acid, and re-precipitated and again weighed, whereby the proportion of phosphates is ascertained. This is again checked by analysis of the sulphide of ammonium solution of the phosphates.

Then, for the determination of sulphuric acid, chlorine, nitric acid, ammonia, and the organic acids, we operate on separate lots of soil, each weighing 1,000 grains. Sulphuric acid is precipitated by means of the nitrate of barytes, chlorine by nitrate of silver; nitric acid is tested in an aqueous solution of the soil, boiling it with a little chlorohydric acid and gold foil, to see if it dissolves any gold, and by evaporation of the aqueous solution to dryness, and testing the deflagration of the dry residue, which contains organic matters mixed sometimes with a minute proportion of nitrate of potash.

There is no direct method of determining the proportion of nitric acid in a soil. It occurs only in minute proportions.

The organic acids of the soil, namely, crenic, apocrenic and humic acids, are separated together from the insoluble humus by means of a saturated solution of carbonate of ammonia, and after filtration, this solution, on evaporation to dryness, will give the weight of these acids, with some phosphates, which are always dissolved by the ammoniacal solution, namely, the phosphates of lime and magnesia. On burning the organic acids, then phosphates are obtained, and their weight is deducted from the combined weight of the organic matters and phosphates. By deducting the weight of the soluble organic acids from the whole weight of organic matters, we have that of the insoluble humus, or carbonaceous matters. We also deduct from the soluble organic acids the weight of the ammonia, and determine by a separate process on another 1,000 grains of the soil. The ammonia is ascertained by digesting distilled water, acidulated with pure chlorohydric acid, with 1,000 grains of the soil; then on filtration, evaporation of the acid aqueous solution, and addition of bichloride of platinum solution, we obtain the ammonia, as the double

chloride of platinum and ammonium, by which it is easy to compute the proportion of ammonia in the organic matter of the soil from the weight of the double chloride. This may be checked by expulsion of the chloride of ammonium, and by weighing the platinum that remains.

This general description of the methods employed by me in the analysis of the soils will suffice for the information of chemists. It would require a volume to describe in detail the processes for each analysis. I have therefore omitted stating the common operations of mineral analyses, since they are known to all who would be likely to criticise my results, and are published in standard works. I would remark, that the Maryland soils contain a much larger proportion of soluble magnesia than those of Connecticut River alluvion, and hence the large proportion of magnesia in the Maryland tobacco; while the lime salts appear to take the place of the magnesian in the Massachusetts tobacco.

It would appear to be indicated that the Connecticut River tobacco soils need the addition of a sulphate, either in the form of sulphate of magnesia or sulphate of potash, and that the Maryland soils need more organic matter, in the form of soluble humus and ammonia-producing manures.

It is surprising to find so little of certain salts in the soil, when they abound in the plants grown in it; for example, the sulphates, chlorides, and phosphates. We can only account for the fact by supposing that, by capillary attraction, the soils continually draw water charged with minute proportions of these salts, and that by evaporation at the surface, the saline solution is concentrated, so that the plant, by this process, draws its saline ingredients from considerable depths. It is well known, from the experiments of Berthier and others, that a much larger amount of saline matter has been found in the crops taken from a field than was contained in the soil at the usual depth of tilth, or even to the depth of a foot. We can account for this only on the theory above proposed, namely, that by the continual elevation of water charged with mineral salts, and by the concentration of this solution, either by evaporation at the surface or by exhalation of the aqueous matter from the plants, a larger amount of saline matter is assimilated in the plants than is contained in the soil permeated by their rootlets.

In certain sandy situations, we observe there is no drought, and the soil is found moist at a little distance from the surface. We know, too, that such soils contain but little saline matter, alkalies, and phosphates, and yet if they overlie green sand, or marl, the crops never seem to be wanting in these saline matters, and it is probable that the water brings them from the marls at some depth from the surface. This view was forced upon me, while examining the sandy soils of New Jersey, which overlie green sand and marl, for the soils themselves could not furnish a constant supply of phosphates and alkaline salts, unless they drew on the subjacent banks of the cretaceous group. • Undoubtedly, much information on this subject may be obtained by analysis of waters from springs and wells in such a

country. The underlying strata must have an important effect on the productiveness of the surface, if this theory is well founded, and we may have to seek deeper in the earth to explain the permanent fertility of some soils and the hungry character of others.

Analyses of the ashes of plants have revealed the nature of the mineral matters which plants appropriate, and that they originate from the soil; but these researches have not yet reached the solution of the problem as to the capabilities of certain soils to produce certain crops, and the incapability of others. Extended series of analyses, both of the plants and of the soils on which they grow, are required to settle this question. Chemistry has done much in explaining the action of fertilizers, and can do still more, the work having but recently been undertaken by competent men; while some hasty generalizations have occasionally led agricultural chemists astray, and thus brought discredit on theoretical opinions. It may now be considered as established, that plants draw their nourishment both from the air and the earth; that they will not thrive on atmospheric elements exclusively; that the saline and organic matters of the soil are essential to healthy vegetation; that plants absorb and digest the organic matters of the soil; and that the organic acids carry, not only ammonia and the alkaline salts, but also the phosphates into the circulation of plants. Ammoniacal solutions, and especially the carbonate of ammonia, render phosphate of lime and phosphate of magnesia soluble in water, and largely so, when the ammoniacal carbonate is charged with the organic acids of the soil. I found, for instance, that 1,000 grains of the Hatfield soil yielded to a solution of carbonate of ammonia 0.39 grains of the phosphates; the same quantity of the Whatley soil yielded 0.587 grains, and the Maryland soil 0.85 grains. Carbonates of lime and of magnesia are also dissolved as bicarbonates, owing to the carbonic acid set free from carbonate of ammonia by the organic acids of the soil, and even alkaline silicates are decomposed, though slowly, by the agency of carbonic acid. Hence we see that carbonate of ammonia does more than merely furnish nitrogen to plants. It supplies, also, many other requisite saline matters, and itself is only safely introduced into the circulation of vegetables by being combined with the organic acids, which it renders soluble and absorbable. It is an error to suppose it is advantageous to "fix" ammonia by means of the mineral acids. It is better that more unstable combinations should exist in fertilizers, so that they may readily undergo those changes in the soil which are needful for the gradual supply of plants with saline matter. Guano is one of the most remarkable of these unstable compounds, yielding ammonia and the phosphates, but it is essential to its most favorable action that the soil should contain an abundant supply of decomposed vegetable matter, or humus, since the carbonate of ammonia acts on this humus and renders it soluble and a powerful fertilizer, while the ammonia, when so combined, is still in the condition of an unstable compound. If other fertilizing salts are needed, such as gypsum, sulphates of potash, soda, and of magnesia, they can be separately added to the soil, and it is better to do so than to mix them with guano to fix am-

monia as a sulphate. By a series of experimental trials, I have no doubt great improvements may be made in the cultivation of tobacco, and though agricultural chemistry may make useful suggestions, it is the planter who is expected to put them to the test. Few plants are so much influenced in their qualities as this, for it is a large consumer of the elements of the soil. The green plant contains 88 per cent. of water, charged with saline matter, and so when 100 pounds of tobacco are dried, they weigh but 12 pounds, and all the salts that were contained in 88 pounds of juice are concentrated in this 12 pounds of the dry leaves. Hence we understand why tobacco yields so large a proportion of ashes, which the planter should remember consist of the most valuable saline matters of his soil, salts that, as my analyses will show him, are not abundant there.

With these remarks, I present, in tabular form, the results of my analyses of eight soils, so that it will be easy to compare the surface and sub-soil of each district and the soils of the Connecticut River alluvion with those of Prince George's county, Maryland. Nearly eight months have been industriously spent in executing this work, and I believe it is more extended and accurate than any soil-analysis heretofore published. It will be observed that while some of them fall short of 100, others a little overrun. This is owing to the inherent difficulties of such analyses, where the work has to be divided into many separate operations, on separate portions of the sample of soil. The errors are all within reasonable limits, and it is a mere accident that one of them comes out exact. These results were only arrived at by numerous repetitions of the processes, the tables having been constructed as the work proceeded, and several of them then culled over, to make up the final account.

RECAPITULATION.

No. 1.

Chemical analyses of soils from Prince George's county, Maryland, from a field which produced the best tobacco—surface soil to the depth of 10 inches—sub-soil 10 inches deep, taken to the depth of 20 inches.

INGREDIENTS OF SURFACE SOIL.	Per cent	INGREDIENTS OF SUB-SOIL.	Per cent.
Silica	82.5000	Silica	85.250
Alumina	3.4600	Alumina	3.840
Lime	0.3100	Lime	0.005
Magnesia	0.8600	Magnesia	0.580
Potash	4.6000	Potash	2.510
Soda	1.1000	Soda	0.620
Peroxyde of iron and manganese	3.3600	Peroxyde of iron and manganese	3.260
Sulphuric acid	0.0017	Sulphuric acid, trace	
Phosphoric acid	0.5000	Phosphoric acid	0.393
Chlorine	0.0005	Chlorine	0.001
Nitric acid, trace		Nitric acid, trace	
Carbonic acid	0.2000	Carbonic acid	0.200
Ammonia	0.0850	Ammonia	0.082
Crenic, apocrenic and humic acids	0.3500	Crenic, apocrenic and humic acids	0.245
Carbonaceous matter—insoluble humus	2.5500	Carbonaceous matter—insoluble humus	3.014
	99.9372		100.000

No. 2.

Chemical analyses of soils from Prince George's county, Maryland, from a field which produced a smaller crop of tobacco than that of No. 1—surface soil to the depth of 10 inches—sub-soil 10 inches deep, taken to the depth of 20 inches.

INGREDIENTS OF SURFACE SOIL	Per cent.	INGREDIENTS OF SUB-SOIL.	Per cent.
Silica	88.0000	Silica	88.5000
Alumina	3.0000	Alumina	3.5000
Lime	1.4000	Lime	0.0080
Magnesia	0.2500	Magnesia	1.0500
Potash	1.8800	Potash	2.0000
Soda	0.4700	Soda	0.7000
Peroxyde of iron and manganese	2.7000	Peroxyde of iron and manganese	2.2330
Sulphuric acid	0.0010	Sulphuric acid	0.0010
Phosphoric acid	0.3000	Phosphoric acid	0.0170
Chlorine	0.0030	Chlorine	0.0024
Nitric acid, trace	....	Nitric acid, trace	....
Carbonic acid	0.3000	Carbonic acid	0.2000
Ammonia	0.0112	Ammonia	0.0114
Crenic, apocrenic and humic acids	0.2200	Crenic, apocrenic and humic acids	0.1500
Carbonaceous matter—insoluble humus	1.7688	Carbonaceous matter—insoluble humus	1.8486
	100.3040		100.2214

No. 3.

Chemical analyses of soils from Hatfield, Connecticut River alluvion, upper terrace—surface soil to the depth of 10 *inches—sub-soil* 10 *inches deep, taken to the depth of* 20 *inches.*

INGREDIENTS OF SURFACE SOIL.	Per cent.	INGREDIENTS OF SUB-SOIL.	Per cent.
Silica	66.4000	Silica	73.000
Alumina	11.6000	Alumina	13.400
Lime	1.6800	Lime	1.344
Magnesia	0.9600	Magnesia	0.292
Potash	6.1840	Potash	3.264
Soda	1.4000	Soda	0.700
Peroxyde of iron and manganese	5.2000	Peroxyde of iron and manganese	5.472
Sulphuric acid, trace		Sulphuric acid, trace	
Phosphoric acid	0.4400	Phosphoric acid	0.528
Chlorine	0.0200	Chlorine, trace	
Nitric acid, trace		Nitric acid, trace	
Carbonic acid	0.4000	Carbonic acid	0.400
Ammonia	0.0561	Ammonia	0.039
Crenic, apocrenic and humic acids	0.5200	Crenic, apocrenic and humic acids	0.160
Carbonaceous matter—insoluble humus	5.1800	Carbonaceous matter—insoluble humus	1.840
	100.0401		100.439

No. 4.

Chemical analyses of soils from Whalley, Connecticut River alluvion, upper terrace—surface soil to the depth of 10 *inches—sub-soil* 10 *inches deep, taken to the depth of* 20 *inches.*

INGREDIENTS OF SURFACE SOIL.	Per cent.	INGREDIENTS OF SUB-SOIL.	Per cent.
Silica	66.572	Silica	66.420
Alumina	12.441	Alumina	12.709
Lime	0.841	Lime	1.624
Magnesia	0.360	Magnesia	0.282
Potash	4.232	Potash	5.620
Soda	1.081	Soda	1.400
Peroxyde of iron and manganese	7.154	Peroxyde of iron and manganese	7.459
Sulphuric acid	0.007	Sulphuric acid	0.003
Phosphoric acid	0.700	Phosphoric acid	0.577
Chlorine	0.003	Chlorine	0.020
Nitric acid, trace		Nitric acid, trace	
Carbonic acid	0.400	Carbonic acid	0.300
Ammonia	0.075	Ammonia	0.056
Crenic, apocrenic and humic acids	0.525	Crenic, apocrenic and humic acids	0.124
Carbonaceous matter—insoluble humus	5.500	Carbonaceous matter—insoluble humus	3.820
	99.891		100.414

ANALYSIS OF THE ASHES OF THE TOBACCO PLANT.

The particular object in the present researches is to determine what mineral elements are abstracted from the soil by the tobacco plants, and the nature and proportions of these elements contained in different parts of the plant, so as to inform the planter what ingredients he is removing from his soil, by the sale of his crop, and what elements he restores when he composts his tobacco stalks, or burns them and puts the results into the soil.

It is generally agreed among planters that tobacco is a great exhauster of the soil, and this opinion is justified and fully explained by the present analyses, while at the same time they show how far one alkali or earth may replace another, without any material injury to the plant. In these results, the influence of the soil on the composition of tobacco is manifest. It appears also that animal manures, furnishing nitrogen, have the effect of causing tobacco to grow quite rank, while its flavor is materially impaired, and a much larger proportion of nitre is introduced into the plants, so that those grown on richly manured and old soils will burn with a manifest decrepitation, like saltpetre paper. This takes place more remarkably in the leaf-stems than in the other portions of the plant.

Every one who has observed the combustion of tobacco must have noticed that the dried leaves produce a great proportion of ashes. This is explained by the fact that the plant is exceedingly succulent, and that its juices contain a large proportion of saline matter, which is concentrated in the dried state, the water alone escaping in desiccation. I found on taking a weighed quantity of green leaves of tobacco from Hatfield, Massachusetts, on Connecticut River, and drying them at the temperature of 212° F., that 100 pounds were reduced in weight to 11; hence the saline matter of 88 pounds of sap, or juice, was concentrated into 11 pounds of dry tobacco. I found also that a very large quantity of juice could be expressed from the fresh leaves, and on evaporation of the aqueous portion, crystals of nitrate of potash, or saltpetre, were obtained in considerable abundance. A portion of the potash from the ashes of tobacco is of course derived from the decomposition of the nitrate, but several other potash and soda salts also exist in the plant, for example, the malate and probably the citrate.

Some new proximate analyses of the juices of tobacco plants ought to be made, to determine the nature and proportions of the organic acids and salts. Special researches on the chemical changes effected by the fermentation of tobacco are also required, to explain the remarkable alterations which this plant undergoes in flavor, and in its medicinal properties, changes so great as to alter its qualities to a wonderful extent. The facts are well known to consumers of tobacco, but they are not sufficiently understood to enable us to control the fermentation, so as always to produce the most desirable results.

As before observed, the proportions of nitre vary in plants grown

on different soils, and it was remarked that the best Cuba tobacco does not deflagrate in burning, while that from Connecticut River and from Manilla are remarkable for vivid decrepitation, owing to the presence of nitre. The nitrates contained in tobacco must very strongly affect the character of its combustion, the result of which will be quite different from that which takes place where none exist. It will be observed, on examination of the results of the present analyses, that the stalks of tobacco are richest in the alkalies, potash, and soda, while the leaves contain a larger proportion of lime. Magnesia and lime replace each other in a curious manner, and this must be owing to the nature of the soil. Variations are also observed in the ratios of the potash and soda, and from some of the analyses, it would appear that lime is substituted in part for these alkalies; but this can only take place to a limited extent.

How far ash analyses and those of the soils will serve to guide us in the cultivation and improvement of tobacco remains to be seen, on completion of the whole task. I trust that what is already done will serve some useful purposes, and certainly this work will inform the planter of the precise nature and amount of valuable mineral salts he disposes of in the sale of his tobacco crop, and on examining the composition of the soil, he will see how much of each of the ingredients, essential to the healthy growth of the plants, he has still in the soil. Hence he can estimate, with a considerable degree of accuracy, how long he can depend upon the natural constituents of his land, and when it will be necessary to restore to it the salts he has withdrawn. Potash, soda, lime, magnesia, and phosphoric acid seem to be the essential elements of fertility, for these are the substances which are most largely removed by the crop. Silica, oxyde of iron, and sulphuric acid are rarely wanting, and chlorine is in most localities abundant in the condition of sea salt and muriate of lime. Organic manures seem to be unfit for this crop, at least those of a nitrogenous or ammoniacal character tend to produce too much saltpetre, and cause the plants to grow rank and coarse.

No. 1.

Analysis of the leaves of tobacco taken from the richest soil in Prince George's county, Maryland.

Five hundred grains of the leaves of this tobacco, dried at 212° F., on being burned in a platinum bowl, gave, of ashes, 72.65 grains, or 14.53 per cent.

On analysis, this ash yielded—

	Per cent.
Silica	8.60
Phosphoric acid	8.50
Lime	22.66
Potash	17.60
Soda	1.40
Magnesia	8.00
Peroxyde of iron and manganese	2.80

	Per cent.
Chlorine	3.76
Sulphuric acid	8.00
Carbonic acid	18.40
Loss	0.28
	100.00

Perhaps, on analysis of the soil from which this plant was taken, we may be able to explain the larger proportion of magnesia found in this tobacco than that obtained from the Massachusetts samples.

No. 2.

Analysis of the stalk of tobacco plants from Prince George's county, Maryland, from the most fertile soil.

Five hundred grains of the stalk, dried at 212° F., when burned in platinum, left 46 grains of ashes, or 9.2 per cent.

This was resolved into—

	Per cent.
Silica	2.40
Phosphoric acid	12.52
Lime	11.48
Potash	40.12
Soda	9.20
Magnesia	0.80
Peroxyde of iron and manganese	1.40
Chlorine	2.96
Sulphuric acid	2.04
Carbonic acid	16.00
Loss and unburnt carbon	1.08
	100.00

Here again it will be seen that it is quite important to restore the tobacco stalks to the soil, since they carry 40 per cent. of potash, 9 per cent. of soda, and 12½ per cent. of phosphoric acid, all valuable ingredients. The stalks may be composted or burned, as most convenient to the farmer. If the soil need humus, it will be best to rot the stalks; but if it contain an abundance of vegetable matter, then they should be burned, and the ashes spread on the field, as directed in the case before stated.

No. 3.

Analysis of the leaves of tobacco from much worn land, Prince George's county, Maryland.

Five hundred grains of the leaves, dried at 212° F., on being burned, left 73.8 grains of ashes, or 14.76 per cent.

This was resolved into the following ingredients:

	Per cent.
Silica	21.20
Phosphoric acid	7.15
Lime	25.85
Potash	20.32
Soda	4.36
Magnesia	2.00
Peroxyde of iron and manganese	1.20
Chlorine	0.92
Sulphuric acid	1.52
Carbonic acid	14.80
Loss	0.68
	100.00

This plant was dried exactly like sample No. 1, in a garret, and carefully kept from dust. It would therefore appear that there is a larger proportion of silica combined with the substance of the plants raised on poorer soil. The other ingredients appear in no way remarkable.

No. 4.

Analysis of a stalk of tobacco—the plant last named, from Prince George's county, Maryland—soil much worn.

Five hundred grains of the stalk, dried at 212° F., burned in a platinum bowl, left 43.6 grains of ashes, or 8.72 per cent.

This was separated into—

	Per cent.
Silica	3.20
Phosphoric acid	10.28
Lime	23.88
Potash	27.84
Soda	7.28
Magnesia	0.40
Peroxyde of iron and manganese	1.30
Chlorine	3.12
Sulphuric acid	4.48
Carbonic acid	18.00
Loss	0.58
	100.00

Here we have a remarkable proportion of lime, more than twice as much as that in the stalk from the most fertile soil, but there is a great falling off in potash, and some in phosphoric acid and soda.

Lime here seems to have been substituted in part for potash. The amendment of this soil by a liberal dressing with wood ashes is plainly indicated as necessary to restore it to its original fertility.

No. 5.

Analysis of the ash of seeds of tobacco taken from sample No. 1, from Prince George's county, Maryland.

Having only 25 grains of this seed, I could not execute so complete an analysis as I wished, but perhaps the following results may not prove uninteresting, though of little practical value, so far as our present inquiry extends, since the seeds weigh so little that they cannot remove much saline from the soil. Twenty-five grains of this seed, burned in a platinum crucible, left 2.4 grains of ashes, which was restored by analysis into—

	Per cent.
Silica	0.20
Phosphate of lime and magnesia	0.50
Carbonate of lime	0.30
Potash and soda	0.95
Not accounted for	0.45
	2.40

The phosphates and the potash are here the most important ingredients, as they are of the ashes of most seeds. The proportion of mineral matters in tobacco seed is not large.

CONNECTICUT RIVER TOBACCO

The Connecticut River tobacco is raised for special uses, and is employed mostly as wrappers for cigars, the large leaves being particularly prized for this purpose. Very large crops are produced on the alluvial soils of the upper terrace of the river, both in Massachusetts and Connecticut. Mr. J. Allis, of Whatley, raises about 2,000 pounds, and William H. Dickinson, of Hatfield, 2,500 pounds to the acre. Mr. Allis' soil is 30 feet above the level of the river. He keeps up the fertility of his land with fine barnyard manure, well composted, or rotted. After a crop or two of tobacco, he lays down the land to grass. Mr. Dickinson's land is similarly situated, but is of superior quality, and is regarded as the best for tobacco in the State.

No. 1.

Analysis of the leaves of tobacco from the farm of W. H. Dickinson, in Hatfield, Massachusetts.

Two perfect plants, selected for analysis, were thoroughly dried in a current of warm air, at 212° F., before weighing.

Five hundred grains of the dry leaves was the quantity employed for analysis, and this weight of the clean leaves yielded 94.6 grains of ashes, or 18.92 per cent.

By the usual methods of analysis I obtained from these ashes—

	Per cent.
Silica, with some silicious dust	9.60
Phosphoric acid	7.60
Lime	25.75
Potash	20.40
Soda	6.03
Magnesia	1.60
Peroxyde of iron and manganese	1.20
Chlorine	1.68
Sulphuric acid	2.75
Carbonic acid	21.20
Loss and carbon not burned	2.19
	100.00

The soil on which these plants grew is an alluvion, or river deposit, of the finest particles of decomposed granite, mica, slate, and new red-sandstone rocks. It contains an adequate supply of lime, and of minerals producing by their decomposition potash and soda, as will be seen on inspecting the analysis of the soil No. 1. Finished compost manure, made in the barn-yard, had been used in preparing the land.

No. 2.

Analysis of the stalks of tobacco plants, from W. H. Dickinson's farm, in Hatfield, Connecticut River, Massachusetts.

Five hundred grains of the stalks, dried at 212° F., on being burned in a platinum dish, left 53.6 grains of a very fusible ash, or 10.72 per cent.

This ash, on analysis, was separated into the following ingredients:

	Per cent.
Silica	0.40
Phosphoric acid	12.52
Lime	11.84
Potash	40.12
Soda	9.20
Magnesia	0.80
Peroxyde of iron and manganese	2.00
Chlorine	2.96
Sulphuric acid	2.04
Carbonic acid	16.00
Loss and unburned carbon	2.12
	100.00

It will here be observed that potash is the principal ingredient in this ash, while phosphoric acid is found also in very notable proportions. The farmer therefore wisely composts his tobacco stalks in the barn-yard, and puts them back upon the soil, thus restoring part of the saline matter the plant had abstracted from it, or, if organic manures are not required, he should burn the stalks and spread the ashes on the soil.

No. 3.

Analysis of tobacco plants from the farm of J. Allis, Whatley, Massachusetts.

I found it impossible to obtain any tobacco from worn-out land, in Massachusetts, and therefore took a sample of a less fertile crop, on the estate of Mr. Allis.

Five hundred grains of the tobacco leaf, dried at 212° F., on being burned, left 101 grains of ashes, or 20.2 per cent.

This, on analysis, yielded—

	Per cent.
Silica and fine adherent silicious dust	29.40
Phosphoric acid	9.05
Lime	28.99
Potash	15.20
Soda	2.52
Magnesia	0.60
Peroxyde of iron and manganese	1.60
Chlorine	0.72
Sulphuric acid	2.72
Carbonic acid	9.20
	100.00

The fine dust could not be separated from the surface of the leaves of the plant, the viscid nature of the plant causing it to adhere; hence a larger proportion of silica is given than is contained in the composition of the plant.

The proportion of lime is larger in this sample than in that from Mr. Dickinson's farm, and a little more phosphoric acid was found.

RECAPITULATION.

Tabular statement of results of analyses of tobacco plants from Massachusetts and Maryland.

NAMES OF INGREDIENTS.	Locality, Massachusetts—Hatfield, Connecticut River, farm of W. H. Dickinson. Sample from the best soil.	Locality, Massachusetts—Town of Hatfield, Connecticut River, farm of W. H. Dickinson. Sample from best soil.	Locality, Massachusetts—Town of Whatley, Connecticut River, farm of J. Allis. Tolerably good soil	Locality, Maryland—Prince George's county. Richest soil.	Locality, Maryland—Prince George's county. Richest soil.	Locality, Maryland—Prince George's county. Much worn soil.	Locality, Maryland — Prince George's county. Much worn soil.
	Per cent. of leaf.	*Per cent. of stalk.*	*Per cent. of leaf.*	*Per cent. of leaf.*	*Per cent. of stalk.*	*Per cent. of leaf.*	*Per cent. of stalk.*
Silica and silicious dust	9.60	0.40	29.40	8.60	2.40	21.20	3.20
Phosphoric acid	7.60	12.53	9.05	8.50	12.53	7.15	10.28
Lime	25.75	11.84	28.99	22.66	11.48	25.85	23.86
Potash	20.40	40.13	15.20	17.60	40.12	20.32	27.48
Soda	6.03	9.20	2.53	1.40	9.20	4.36	7.28
Magnesia	1.60	0.80	0.60	8.00	0.80	2.00	0.40
Peroxyde of iron and manganese	1.20	2.00	1.60	2.80	1.40	1.20	1.30
Chlorine	1.68	2.96	0.73	3.76	2.96	0.92	3.13
Sulphuric acid	2.75	2.04	2.72	8.00	2.04	1.52	4.48
Carbonic acid	21.20	16.00	9.20	18.40	16.00	14.80	18.00
Loss	2.19	2.13	0.00	0.28	1.08	0.68	0.58
	100.00	100.00	100.00	100.00	100.00	100.00	100.00
	Per cent. of ash. 18.92	*Per cent. of ash.* 10.72	*Per cent. of ash.* 20.2	*Per cent. of ash.* 14.53	*Per cent. of ash.* 9.2	*Per cent. of ash.* 14.76	*Per cent. of ash.* 8.72

FORAGE AND OTHER CROPS.

ON THE CUTTING AND CURING OF HAY.

In making hay, the main object is to preserve it in the condition most nearly resembling the grass in its perfect state; and in order to accomplish this, it is necessary, in the first place, to know when it has reached that state, to enable the farmer to fix upon the proper time for mowing.

Chemistry informs us that, of the various ingredients which compose grass, those portions which are immediately soluble in water are the best fitted for purposes of nutrition; and, therefore, it should be cut at that period when the largest amount of gluten, sugar, and other matter soluble in water, is contained in it. And that period is not, generally speaking, when the plants have shot into seed, for the principal substance is then woody fibre, which is insoluble in water, and therefore unfitted for being assimilated in the stomach. It has been ascertained that, when the grass first springs above the surface of the earth, the chief constituent of its blades is water, the amount of solid matter being comparatively trifling. As its growth advances, the deposition of a more indurated form of carbon gradually becomes more considerable, the sugar and soluble matter at first increasing, then gradually diminishing, to give way to the deposition of woody substance; the saccharine juices being in the greatest abundance when the grass is in full flower, but before the seed is formed. During all the latter part of the process of fructification, the formation of the seed, &c., the sugar rapidly decreases in quantity, and when the seeds have arrived at maturity, the stem and leaves begin to decay; so that, if the grass is not cut when in flower, a great amount of nutriment will be wasted. Many of the natural pasture grasses, however, are exceptions to this rule; some possessing a greater nutritive value when the seed is ripe than at the time of flowering. In the Timothy grass, *(Phleum pratense,)* for instance, the culms are found to contain more nutritive matter when the seed is ripe, than those of any other species of grass that has been submitted to experiment—the value of the culms simply exceeds that of the grass when in flower in the proportion of 14 to 5. Notwithstanding this, it has been contended that, although there is more nutriment contained in the seed-crop of this grass than in the flowering crop, the loss of the aftermath, or second crop, which would have been produced during the time the seed was ripening, would more than outweigh the superior quality of nutritive matter contained in the seed-crop. But, for reasons given at page 249, in the Agricultural Report of the Patent Office for 1855, the cutting of Timothy before the process of desiccation has commenced on its stalks, would prove fatal to a future crop from the same roots.

The proper period for mowing grass, so as to secure the largest amount of nutrient properties within it, being thus determined, the next consideration is the preservation of these useful qualities in the hay. Experiments show that, out of the various constituents of which this crop is composed, the mucilage, starch, gluten, and sugar (which are soluble in water) are alone retained in the body of an animal for the purposes of life, the bitter extractive and saline matters being considered as assisting or modifying the functions of digestion, rather than as being truly nutritive parts of the compound, and being voided with the woody fibre. The latter serves only to give bulk to the food, and therefore, distension to the stomach, which, when moderately filled, brings those muscles into active exercise, tending so much to promote healthy digestion, by keeping the food in constant motion. The principal object, then, to be aimed at, in hay-making, is, to retain the soluble portion of the grass in perfect integrity and the removal of its moisture.

The great art of converting grass into hay consists in rendering it sufficiently dry to prevent its taking on too great a degree of heat in the stack or mow, and at the same time preserving a large proportion of the natural juice of the plants. Where the medium can be obtained with the greatest exactness, the best and most nutritious hay will be produced. It is, however, a difficult point, and requires much care and attention. In fine seasons, the danger is of not making it sufficiently, while in those of the contrary description, it is apt to be made too much. This is fully evinced by the great inconvenience which is frequently sustained from the heating of the stacks in the former case, while in the latter, it is but seldom heard of. It has been suggested that in making hay, some attention should be paid to the quality of the soil and to the kind of herbage growing upon it. The hard, benty hay of a poor soil is in little or no danger of heating in the stacks. It should therefore be put together very early, in order to promote a considerable sweating, as the only means of imparting a flavor to it, which will make it agreeable to horses and lean cattle, as it will be nearly unfit for every other sort of stock. It is the succulent herbage of rich land, or land highly manured, which is most likely to generate too great a degree of heat. Grass from such land should have more time allowed in making it into hay. In moderately hot seasons, the proper time of drying may be easily judged of; but when they are very hot and scorching, it is easy to be mistaken, as in such weather the grass becomes crisp, rustles, and handles like hay, before the moisture, or sap, is sufficiently dissipated for it to be in a fit state to be laid up in large stacks. If that be done, however, when it is thus insufficiently made, it mostly heats too much, becoming, in some cases, mow-burnt.

There is another circumstance of much consequence, though difficult in many cases to be performed; that is, "carrying" the whole of the hay just at the moment it is sufficiently made, which is necessary in order to its yielding the greatest possible weight, and preserving the best quality, as every minute after that precise time, it continues to lose both its weight and its nutritious qualities by

evaporation, as is evinced by the smell. Even the difference of an hour, in a very hot, drying day, is supposed to occasion a loss of 15 or 20 per cent. on the hay, by its being carried beyond the point of perfection; and frequently even a greater loss is sustained.

It is an essential point that the mowers should be expert, and perform their work neatly and evenly, making the scythe cut as near the ground as possible, in order to insure the greatest bulk of hay, and to facilitate the springing up of the young shoots of the aftermath, where it is desirable it should be obtained. They may begin work at or before sunrise, and continue until after sunset. From an acre to an acre and a half, according to the bulk of the crop, is considered a fair day's work for a man. As soon as the dew is off, the mowmen should be followed by other men or boys, with forks, to shake and spread the swaths evenly over the surface of the meadow; or this may be more economically and expeditiously done by means of a "tedding machine," drawn by a horse, which will do the work of twelve or fifteen hay-makers, and distribute the grass more thinly and evenly as it crosses the field.

The newly-mown grass must not be allowed to lie long beneath the scorching heat of the sun without being turned; for by thus doing, the upper part becomes brown and withered, whereas it is desirable to keep it as green as possible. All which has been turned in the course of the day ought to be thrown together the same evening, by means of horse-rakes, into "windrows;" that is, long rows throughout the field. By the common method, they are gathered together by the haymakers working in opposite directions, the two outside by boys, using hand-rakes, the others forks; the hay gradually accumulating, whilst thus being sent on from one to another, towards the place of the intended windrow, until it forms, from a party on each side, a double row, and two men follow, putting these two into one large, compact row about 5 feet wide and 3 feet high. Or, the hay may be put together into small "cocks," or heaps—the former method being preferable for expedition, and affording sufficient protection from heavy dews; the latter more secure from the injury of rain, and may be adopted, if the weather prove cloudy or adverse. The following morning—or on the return of suitable weather—the whole must again be opened or thrown out, so as to secure the greatest possible benefit from the sun's rays and drying winds; and the grass mown on the preceding night, and early that morning, may be spread when the dew is off, and afterwards turned; and, provided it be fine drying weather, the first day's hay will now have been sufficiently "made;" that is, it will have lost most of its moisture—the chief part of its natural juices remaining, and, as it has been well scattered about and frequently turned, this will have been effected without some portions of the grass being too much withered and others still too succulent. It will retain its fine light green color, and the farmer's aim now is to secure it with the greatest possible haste. For this purpose, the hay is gathered into windrows, and these rows divided and collected into cocks, which may be done by forking, care being taken that they are "made up" neatly and well, to keep out the dew or rain. Unless

the aspect of the sky betokens approaching showers, the smaller cocks, made by rolling up the windrows with forks into proper-sized heaps, will be best. The next morning, or as soon as the weather admits, they may be well thrown out in "staddles," or beds, of a few yards in width, to insure the hay being sufficiently dried; and it will then be ready for "leading." Of course, the farmer must not be implicitly guided by any given rules for haymaking; as in this operation he has to depend upon a very fickle and changeable power, namely, the influence of the weather; he must vary and modify them to suit circumstances. The object to be aimed at can alone be exhibited to his view, and a model method pointed out for him to imitate as closely as possible.

First, he must remember that the chief point is to preserve the hay from dew and rain—water washes away the soluble salts and other matter; and, when in the stack, or mow, will cause fermentation, which injures the hay by destroying some of its most valuable properties; therefore, bring it into windrows, or make it into cocks at night-fall, and never open it in the morning before the dew has evaporated.

Second, bear in mind that if the weather is unfavorable, the less the hay is disturbed the better, and the longer will it retain its inherent powers. It has been found to preserve a great amount of its nutritive qualities for many days, nay, even weeks, when mown wet, or when saturated with the rains whilst lying in the swath; if, therefore, the weather be unpropitious, it will be better not to spread it at all, nor even to turn over the swath. If repeatedly dried and wetted again, it soon becomes valueless. This error of meddling with hay amidst frequent showers, must, if possible, be avoided; for it is far better to have it somewhat tainted in the cock than thus exhausted of its nutriment, and spoiled by being repeatedly spread.

Third, take care not to allow the hay to remain long under the hot beams of the sun without being turned. This will preserve the color and fragrance of the grass; so that, without baking it too much, (thus destroying its virtues,) it may be so dry that but little heating or fermentation shall occur in the stack; remembering also that coarse grass does not require so much "making" as fine succulent herbage.

CURING CLOVER.

As the importance of promoting fermentation in hay from its own juices is not perhaps sufficiently considered in this country, in curing clover, I present the following method, condensed from the "Irish Farmers' Journal," by which, not only the labor of a number of hands is saved, but the hay is better and more nourishing. The hay is prepared by self-fermentation, whereby it retains its nutritious juices and only loses its watery particles; it is dried more expeditiously by dissipation of its humidity, and contraction of the sap-vessels, and then its nutritious juices are concentrated. This process is conducted in the following manner: The sap-vessels are expanded by the circu

lation of the liquid juices by heat, and the superfluous humidity is exhaled. On cooling, the sap-vessels contract, and thus future inner fermentation is prevented and the nutritious quality preserved. Upon this principle, the clover intended for hay, after having been mown, remains till four o'clock in the afternoon of the following day in the swath to dry. It is then raked together into small cocks, and afterwards made into large ones of a conical form, and such as would require six or eight horses to remove. To prevent the air from penetrating these cocks, and to produce a quicker fermentation, while forming, they must be trodden down by one or two men. If it be a still, close, warm night, its fermentation will commence in four hours, and manifest itself by a strong, honey-like smell. When a proper fermentation is begun, the cocks, on being opened, will smoke, and appear brownish, and may be spread abroad. If in the morning the sun is warm, and a little wind rises, the clover-hay will quickly dry. It may then be turned with a rake or pitchfork, towards noon, and about four in the afternoon, it will be sufficiently dry, so that it may be immediately carted into the barn without any danger of a second fermentation.

As this method of making hay depends principally upon circumstances, the new-mown clover, when brought together into large heaps, may ferment equally and expeditiously; and if the day succeeding the fermentation be dry, sunny, and windy, it may be proper to point out what should be done when circumstances are unfavorable. Let us suppose, therefore, that if the night after the mown clover has been collected into great cocks be cold, damp, or rainy, the fermentation will yet take place, although it may require a term of twelve, sixteen, or twenty-four hours to effect it. If it be a second or third crop, at which season the nights are colder, it may even require from thirty-six to forty-eight hours before the fermentation ensues. It will commence, however, and may be ascertained from this circumstance, that one can scarcely bear his hand in the interior of the cock. Even if the night be dry, and a strong, cold wind is blowing, the cock may not ferment equally, but only in the middle, and on the side opposite to the wind, the other parts remaining green. In such a case, the following rules may be attended to:

First, if the cock has only fermented in the middle and on the side opposite to the wind, the whole heap must nevertheless be opened the following morning. That which has already fermented must be separated and spread to dry. It should be turned towards noon, and may be carted into the barn in the evening; but that part of the cock which has not fermented must again be put together into large cocks, and fermented in the same manner as the preceding part, after which, it may be spread to dry and brought to the barn or stack.

Second, in such cases where only a small portion of the cock has fermented thoroughly, the heap must be spread abroad in the morning, again be made into a close cock in the evening, in such a manner that the part which has fermented shall be placed at the top or outside, and that which has not fermented be inclosed within; then, on the ensuing morning, or if the weather be cold and rainy,

on the morning afterwards, the clover heap must be again spread abroad, and treated as above.

Third, if in spreading the heap abroad, it be found that nearly the whole of the clover has fermented, it will not be necessary to delay the housing of the whole on account of some small portion; but it may be dried and carted into the barn. The small portion remaining unfermented will not occasion any disaster to that which has fermented; for there is a material difference between hay thus managed and a meadow-grass, that is brought whilst damp or wet with rain into the barn, and will then grow rusty and putrid.

Fourth, in such instances where some of the cocks of clover have thoroughly fermented, and it rains in the morning, they ought to be spread abroad, even if it rains violently; since if it were suffered to lie longer in the heap, it would take fire, or its juices would be injured by too much fermentation; the leaves and stalks would become black, and the hay unfit for food; therefore, if the rain continue, spread clover must be turned from time to time, but not carted into the barn till dry. This drying takes place, if the rain cease for a few hours, much more expeditiously with the clover which has fermented, than with that made in the common way. Besides which, it must be remarked, that the fermented clover remains good, even if it continue some weeks exposed to the rain, provided it is at last suffered to dry before it is put into the barn; otherwise the wet from the rain will render it musty. That which has been for so long a time exposed to the rain, will not, however, be so nutritious as the part well fermented and sooner dried; but it will be far better than that exposed to the rain, and harvested in the common method.

If the weather should be remarkably hot, one may, by adopting this plan, prevent a frequent accident, namely, grass hastily made into hay, however dry it may appear to the hand, contains within its fibres much humidity; and, from this cause, when trodden down in the stack will ferment rapidly, the humidity endeavoring to escape, which often "fires" the stack.

D. J. B.

ON THE CULTIVATION OF COFFEE.

There is no species of culture, perhaps, which offers a more pleasing prospect than that incident to a coffee plantation. From the period at which the feeble plant is first committed to the soil, till the tree has arrived at maturity, the various changes which Nature undergoes afford much for study and reflection; but the time when the interest is the most heightened, and wonder ensues, is at the application of science and skill, by means of pruning, as the tree then assumes its beautiful, dark-green foliage, and the branches appear in symmetrical form. A small shrub, of a delicate and unpromising character at first, is now fully developed, and ready to show its grati-

tude for the care bestowed on its earlier years by yielding an increase of a hundred fold.

The cultivation of the coffee shrub, so as to obtain from it yearly a certain quantity of fruit, without too much detriment to its parent, is a subject of immeasurable importance to those engaged in it; but a considerable diversity of opinion has occurred as to the best means of gaining so desirable an object, owing doubtless, in a great measure, to the geographical position, elevation above sea-level, and nature as well as aspect of the soil in which it has been grown. This being acknowledged, it cannot be denied that the task of imparting correct information in the limited space of the present paper would be difficult, if not impossible. I will therefore present some of the chief points in the culture of this product in Central America, the West Indies, and the island of Java.

CENTRAL AMERICA.

The cultivation of coffee, which forms the present wealth of Costa Rica, has raised it to a state of prosperity unknown in other parts of Central America. It was begun about twenty years ago. A few plants having been brought from New Granada, being successful on a first trial, caused this species of industry to be rapidly extended. The land which has been found by experience to be best adapted to its growth is a black loam, and the next a dark red earth—soil of a brown or dull yellow color proving quite unsuitable. The plain of San José, for instance, is mostly of the first class, being, like all the soils of these regions, formed with a large admixture of volcanic materials. Contrary to experience in Java and Arabia Felix, the shrub is here found to thrive much better and produce a more healthy and equal berry on plain lands than upon hills or undulating slopes, which, doubtless, arises from the former retaining its moisture better and containing a larger deposit of loam. The practice of sowing coffee on sloping land, in Java, has been attributed to the fact that the plains are generally occupied by the more profitable culture of sugar-cane. In Arabia, the more level lands are principally of a sandy nature, having apparently at no very distant geological period formed the bed of the sea. which may account for the plantations existing only upon the low hills and slopes.

A coffee plantation, in Costa Rica, produces a crop the third year after it is planted, and is in perfection the fifth year. The trees are planted in rows, with a space of about 3 yards between each, with the plants about a yard apart, resembling, in appearance, an evergreen hedge. The weeds are eradicated and the earth slightly turned with a hoe three or four times in a year; and the shrub is not allowed to increase above the height of 6 feet, in order to facilitate the gathering of the fruit. The coffee here begins to flower in the months of March and April, and the berry ripens in the plain of San José in November and December.

As soon as the crimson color assumed by the fruit indicates the time for cropping, numbers of men, women, and children gather

the berries and pile them in large heaps to soften the pulp, in which state they remain for forty-eight hours. They are then placed in tanks, through which a stream of water passes, where they are continually stirred to free them from the pulp, when they are spread out upon a platform to dry in the sun; but there still exists an inner husk, to be removed, when perfectly dry, by treading the berries under the feet of oxen on the smaller estates, and on the larger by water-mills, by bruising the berry slightly so as to break these husks, which are afterwards separated by fans.

The entire cost of producing coffee, in Costa Rica, including the keeping of the estate in order, clearing or pruning the plants, and gathering and preparing the berries—the average price of wages of each person employed being 25 cents per day—is about $2 50 per 100 pounds.

JAMAICA, W. I.

On the first establishment of coffee plantations, in the West Indies, the trees were allowed to grow up to their primitive state; that is, the young seedling was planted in the usual manner, and kept clear of weeds; but no means were taken to ascertain whether science could be applied to its cultivation, so as to render the shrub more fruitful and profitable. It was therefore permitted to grow to the height of 10 feet and upwards, so far as the richness of the soil would allow it to extend. Fields were not unfrequently seen in which Nature had thus taken her own course, and where the trees threw up suckers to a height of nearly 12 feet. These suckers, in favorable seasons, bore prodigiously, but after they were relieved of their fruit, they died away, and gave place to a new vegetation of the same description. Among the French refugees, who went from Hayti to Jamaica at the time of the revolution of that ill-fated country, this system of culture prevailed; but they were induced to alter that course of management, and to resort to the use of the pruning knife.

The land best adapted for the cultivation of coffee, in Jamaica, is the loose, gravelly or stony, and the chocolate soils; but the tree sustains life and yields fruit, though not to a great extent, in other soils. The rich, black mould is peculiarly favorable to this shrub, and will produce it like other fruit trees in perfection in a seasonable climate. Although fields have been established on rich soils, where an immense foliage was thrown out, and always appeared green and beautiful, yet they proved fruitless. A clayey soil favors dampness in wet weather, whilst it becomes dry and sterile at the opposite change, and stops vegetation in the tree. It is not unfrequently mixed with a stratum of marl, to which, as soon as the roots of the tree arrive, decay is induced, the first indication observed being a yellowness of the leaves that soon shrivel, and at length drop off, when Nature yields and life becomes extinct.

In virgin lands, after the usual preparation of felling and clearing away the wood, the coffee plant is managed in the following manner:

The field is lined off into rows and cross rows from 6 to 7 feet apart each way, as the richness of the soil and the prospects of the climate may warrant. At the intersection of the lines, pegs are inserted to denote the points assigned for the reception of the plants; and the persons engaged in putting in the young suckers, these being preferred to seedlings, follow with spades, and as the pegs are removed, holes are dug about 18 inches deep, into which the plants are inserted, when the earth is gently filled in about them, leaving from 6 to 8 inches exposed above the surface. Formerly, it was customary to raise nurseries by planting the berries at the period of their maturity, whence a regular supply of plants could be obtained for laying out new fields; but this method has fallen into disuse in consequence of the quantity of young trees to be found growing spontaneously on abandoned lands of plantations, produced by seeds taken from cultivated fields by rats and birds. The suckers are drawn, and after their roots are trimmed off, cut into lengths of about 2 feet. Good stout stumps are generally preferred, as they vegetate with greater vigor. A small eye is the first indication of vegetation which attracts notice; then a bud, a couple of leaves, and joints and leaves follow in Nature's course. The young tree throws out its lateral branches at each joint, which process is continued in regular succession till the tree arrives at the height of 4½ feet. It is at this period when science is first called into action by "topping," which is performed by cutting off the upper branches with a knife, so as to reduce the tree to a height of 4 feet. This operation has a wonderful effect on vegetation—the branches in their turn begin to throw out buds, which, in time, become the limbs termed "collaterals," and in the course of eighteen months, the tree will have attained its full bearing point, presenting a spectacle of amazing beauty as well as of order, and exhibiting a remarkable pea-green hue.

The most difficult and yet important portion of plantation management consists in the attention required to keep the fields regularly and properly pruned. There can be no specific rules laid down, however, for the guidance of the uninitiated in the art of pruning. General directions might be given, but they are so liable to be interfered with in their application by constant changes in the climate and seasons as to render their intent unavailable. It may be sufficient to say that the tree throws out lateral branches in the first stage of its vegetation, which are called "primaries." Should these be cut off, or broken from the stem by accident, their place can never be supplied by a growth of the same kind, "suckers" and "gormandizers" following. The latter cognomen is applied in consequence of its sucking voraciously all aliment from the tree. It resembles a sucker, with this difference, that the sucker springs in an upright direction from the joints, while the gormandizer shoots out horizontally. Trees suffer much and soon waste away, when they become addicted to this branch, which arises frequently from careless and ignorant pruning, by cutting off primaries; but in old fields, they grow naturally from the stock. Whenever the tree can stand such a course, they should be exterminated from their sockets; but when

they have assumed the place of primaries, which have been inadvertently destroyed, it is impossible to change their order; for, so soon as one is removed, another is sure to assume its place. In this case, it would be as well to allow them to remain and bear, taking them out after every crop.

All trees require a certain amount of light and respiration to conduce to their vigor and health. With the coffee tree, these are in an unusual degree indispensable; a constant and regular circulation of air should be transmitted through its head, and the light should fall upon its trunk. After a severe pruning, the vegetation is rank and stunted. The prudent planter now watches his opportunity, and as soon as he perceives the young wood of sufficient growth, he directs the opening to be performed. The heads of the trees are first stripped of their leaves, so as to form a clear space of at least 6 inches from the original stem, afterwards all those which run transversely; and as the operator proceeds, he removes everything which appears "spindly" and stunted, leaving the rich, healthy, "black wood" to produce the crop. When fields are kept in good order by light annual prunings, there are always two growths of wood to be seen—the first in advance and ripe for the crop, and the second shooting out to ripen for the ensuing year. It may have been remarked that the wood of this tree is of a greenish color, and rather soft, when young; but as it matures, it assumes a brownish and hardy appearance. In topping new fields, these signs must be strictly attended to; and the trees should not be topped till the wood has ripened at the point at which it is intended to be cut. As the trees begin to produce in about three years after planting, and as they generally bear heavily at the time of topping, unless the parent stem be sufficiently mature to sustain the weight of the branches loaded with fruit, the unripe portion will break, and thus both tree and fruit will be destroyed.

The climate, as well as the seasons, vary so materially in this island, that the growth of the tree, as well as its cultivation, must necessarily differ according to its peculiar locality. In some districts it does not come into full bearing before it is seven years old, whilst in others it fruits in half the time; and the longevity of the tree presents a still more remarkable difference; in the one, fields have been seen in cultivation upwards of half a century old, whilst in the other, fifteen years may be taken as the mean age. Soil certainly does not of itself create this difference, as the same indications of favorable moulds are observable in each district; but it may rather be attributed to the climate. In the elevated regions where coffee plantations have been established, below the range of the Blue Mountains, the temperature, though cold and bleak, is dry and healthy; whilst in St. Thomas in the Vale, where the lands lie considerably lower, the atmosphere is warm, though damp, and visited with continuous fogs and rains. The climate of Jamaica, therefore, is so diversified in its character that no time can be assigned as the most favorable for pruning. In these altitudes, where the tree vegetates nearly all the year round, pruning may be performed during the whole period. It

is evident, however, that there are certain seasons of the year when the sap lies dormant in the tree, and not the slightest circulation i perceptible. If the object be to obtain a copious and healthy supply of young wood, this season could not be deemed suitable for the purpose; for fields which have been pruned in November and December have been known to remain in a dormant state, and not to throw out a particle of young wood until the spring of the ensuing year. The months of May, June, July, and August are those in which it has been observed that pruning acts beneficially on the tree in the upper districts; but it has often happened that in a late crop the fruit has not been removed up to August; consequently, the pruning had to be delayed until September and October.

The due cleaning or weeding of coffee fields is equally requisite to their proper culture as pruning; but this forms a mere piece of physical labor, neither requiring much skill nor ingenuity in its exercise. Some care and consideration, however, should be observed in this portion of management as to who directs its performance. Established fields in dry climates do not need more than two weedings a year, before and after harvesting; but in a wet climate three or four are requisite. The weeds, which are taken out by the hoe, form an excellent manure, by heaping them up beside the trees, to admit of decomposition, and at the next cleaning the mould thus obtained should be carefully applied to their roots.

The manuring of old fields, with a view to their improvement, is an essential part of their cultivation. As guano is found to be a very expensive renovator on this island, and as its properties do not prove to be of so durable a nature as is desired, a cheaper and more efficacious fertilizer has been produced on plantations by ordinary means—such as the penning of stock, and obtaining their excrement, and saving the fan-trash and pulp of the coffee. A combination of the properties of the three manures forms a most effectual amendment to the declining soil—a fact which is evinced in the richness and luxuriance of the trees, whenever the pulp or trash has been washed about their roots by the rains.

The indications of bearing in a coffee tree are usually manifested by the hanging down of the leaves and the swelling of the joints whence issue the buds. The blossoms may have been kept in this state for weeks and even months during dry weather; but so soon as a shower of rain falls, the buds shoot with astonishing rapidity, and in two days after, the field will present a mass of snowy whiteness, the fragrance of which is grateful to the senses, and the whole scene imparts to the beholder pleasure and satisfaction. Like other fruit trees this shrub is acted upon by the seasons, upon which late and early blossoms become contingent. In the warmer districts, the March blossom is most calculated upon, although expectations for a crop are not given over before the end of May. In the colder regions, blossoming may commence in March or May, which is considered early, but July and August give the strongest and most general flowers, and even large blossoms occur in September and October, such being the peculiar changes brought about by the seasons. Three

periods of blooming are usually looked for, although good crops have been made from a single heavy and regular flowering. The blossoms shoot out in bunches similar to those of the Spanish jasmine, but they decay in the course of two days, when the fruit is supposed to be formed upon each; the blossoms either drying, or in heavy rains, falling off the trees. In the colder climates, the fields are sometimes seen for months in a continual spitting blossom, and yet no fruit results, as the flowers previous to setting are chilled; and often the young fruit also becomes chilled, turns black and drops. But in warmer climates, the fruit rapidly advances, and in the course of the month, grows to the size of a small pea, whereas, in colder localities, two months elapse before it arrives at that stage. While the fruit is young, and until the beans begin to form, it will resist the influence of dry weather; but after that period, it droops and feels much the want of moisture, as if Nature, at that particular juncture, required some assistance in her efforts to perfect the fruit. From the time of the appearance of the blossom to the harvesting of the berry, seven months may be allotted, although crops have been gathered in favorable seasons from a six-month blossom; yet in the upper mountains, the fruit does not mature before the end of eight months. Thus the coffee begins to ripen in warm districts in August, and in cold ones, in February, at which period the former crop is finished, whilst in the latter it lasts till August.

The fruit is harvested when in a blood-red state. The laborers are principally accustomed to collect the crop in baskets; and when the coffee is bearing heavily, and is at full maturity, a good picker will gather 4 bushels a day and carry them to the works. The fruit, after being measured, is thrown into a heap in the loft above the pulping machine, to which it is subjected, if not immediately, within twenty-four hours after picking; but it not unfrequently happens that the manager is unable to pulp his coffee under two or three days, by which time, fermentation takes place, and it becomes impossible, after pulping, to wash off the mucilage then adhering to the outer envelope of the berry, and imparts to the produce a "red" or "blanketty" appearance when spread on the platforms. The produce is let into the pulper through a small hole in the floor of the loft, and by means of a grater, forcing the fruit against the chops, the berries are dislodged from the pulp and fall upon a sieve, which, being shaken by the machinery, causes the berries to drop into the cistern, whilst the grater catches the pulp, carrying it backward at each evolution of the roller. Any fruit which may have passed through the machine, half squeezed, and having only ejected one bean, is returned to the hopper to undergo the process a second time. The pulped coffee is permitted to remain in the cistern for a day and a night, during which it ferments. It is then washed in two or three waters, when all the mucilaginous matter, which had risen from the berry by fermentation, is washed off, and the beans present a beautiful white appearance. It is next turned out to drain on a platform so sloped as to throw all the water to the centre. where a conduit is placed to carry it off. In an hour or so after, the coffee is

moved to other platforms for curing, where it is thinly spread out and exposed to the sun, which, if shining strong, in eight or nine hours causes all the moisture to evaporate, and the produce is fit for housing that day. From the time the coffee is first exposed to the sun till the "silver skin" starts, is the stage during which the produce suffers most injury. At the commencement of the process, it is constantly turned, in order to get rid of the water as early as possible; and after it has been housed, the greatest precaution is taken to prevent its heating; and for this reason, early housing is disapproved of, for if wet weather intervenes, and the coffee cannot be turned out, it will become heated, and may remain on the platform for several weeks, without the slightest advance in curing; in this case, unless it be frequently turned while in a wet state, it is sure to vegetate. The berries first swell, then a thin white spire issues from the seam, and on opening the bean, the young leaves will actually be seen formed inside, so rapid is the course of germination. Hence the coffee should not be housed till the silver skin begins to start, when no danger can ensue; for, if a few wet days should follow, by turning the coffee in the house, and exposing it to a current of air, it will keep for weeks. It is at this stage that the parchment skin begins to show itself, which at first adheres to the beans, as the heat of the sun starts it from its hold and causes it to separate; thus on shaking a handful of the produce, it will be heard to rattle—a certain indication that the silver skin has risen from the bean. As before observed, the bean is perfectly white till the silver skin starts, when it begins gradually to assume the dark, or what is called the "half-cured" appearance. A day's exposure to a strong sun will then half cure it, and by subsequent exposure, the produce takes another stage, gradually losing the half-cured, and assuming a bluish tint; and when it is properly cured, not the slightest dark spot will be perceptible in the bean, which should exhibit a horny blue color. When the coffee is perfectly cured—which is generally ascertained by threshing out a few berries, and observing if they have attained this horny blue—it is fit for milling. Here the parchment and silver skin are dislodged from the berries by means of the friction of a large roller, passing over them in a wooden trough, out of which they are taken and submitted to the fan or winnowing machine, when the trash is all blown away, and the coffee, passing through two or three sieves, comes out perfectly clean and partially sized. It is then again sifted, in order to assort it into proper sizes, hand-picked, put into bags or tierces, and sent to the store.

A variety of circumstances tend to injure the quality of the coffee, which it is beyond human agency to control. Dry weather intervening at the particular period when the berry is filling out, subjects it to be stinted and shrivelled, and strong, dry breezes, happening at the same period, will cause an adhesion of the silver skin, not to be overcome by the ordinary process of manufacture and curing.

A manifest preference is given in the leading markets to coffee which has gone through the pulping and washing process, but, singular as it may appear, the consumers of this beverage, perhaps, are not

all aware of the fact that the produce which is cured in the pulp furnishes a stronger decoction than an equal quantity of the same that has undergone the other process. Many are of opinion that the mucilaginous substance which is washed off, in pulping, is absorbed by the bean when cured in the pulp, and which gives strength to the coffee, and enhances its aromatic flavor. On most estates in Jamaica, it has been customary to cure the remnants of the crop in this way, for domestic use; and it has been remarked by epicures in the flavor of the decoction, that the article thus cured produced the strongest and best drink.

JAVA.

In Java, the lands which appear to be best suited for the growth of coffee are situated between 1,000 and 4,000 feet above the sea-level, although it thrives in regions less elevated; but the cultivation is more difficult, the tree yielding less fruit and not being so durable. The valleys lying between high mountains are especially adapted for plantations, as the soil, which is washed down from the heights, affords continuous food to the plants, the valleys themselves being moist, since the hills surrounding them attract rain. These valleys are also protected from severe winds. Forest lands, especially those in which the black leafy or vegetable mould is found to a considerable depth, are the richest, and will support the shrub for many years. These lands are also cultivated with the least expense. Dark-brown soils, approaching to black, without having much clay in them, appearing to the eye to contain a mixture of coral, have also sufficient strength and substance to give nourishment for many years to the plant; but the culture is more difficult than that of the lands last mentioned, because the young plants do not speedily strike root, and sometimes die. Reddish and loose soils, such as are often found in the neighborhood of volcanic formations, are frequently well adapted for coffee, on which it flourishes luxuriantly, but does not endure so long, as the ground possesses less strength.

After the land has been cleared, in the dry season, by rooting out, drying, and burning the bushes, or undergrowth, and the thickets removed, ploughing is commenced, which usually occurs in September. When the ground has been twice deeply ploughed, the small roots are collected together with a rake and carefully burned. The depth of the ploughing is regulated by the nature of the soil, but not deeper than the stratum of the surface soil, as the sub-soil, when brought up to the air, proves injurious to the plants the first year. The ground is then left for some days to allow the moisture to evaporate, after which it is again ploughed and cleaned with the rake. Again, after waiting for some days, it is ploughed for the fourth and last time, and made clean and friable. On small plantations, this is done with the spade; but on large estates, a roller is used, which consists of a heavy piece of round wood, 8 or 10 feet long, with a pole attached in the middle, and is drawn by oxen. The driver sits or stands upon this roller to give it greater force. By the time the

field has been properly ploughed and rolled, in the above manner, the middle of October will have arrived, when paths are opened through the plantation, from the highest to the lowest points, about 2 rods broad, by means of which the whole land is divided into separate parcels. The size of these parcels is regulated by the nature of the estate. On flat or gently declining land, they are greater than on steep grounds, in order to prevent the washing away of the soil, where the water must be let off by drains from one to two feet in depth, which of themselves make the divisions smaller. On precipitous grounds, small ridges are raised between the rows of coffee, to prevent the rich earth from washing down by heavy rains. The steeper the land, the closer are the ridges; and care is taken to incline them so as to break the descent of the water. The first ridges are made with the branches of trees mixed with earth, or with the rubbish cleared from the field.

Transplanting from nurseries is absolutely necessary in the cultivation of this shrub, and the trouble they cost is always doubly repaid. Having a choice of plants, one can be convinced he has taken none but healthy trees, and can therefore proceed with a confidence of success. In the month of October, or earlier, if coffee trees are near at hand, nurseries are prepared in the neighborhood of the land about to be planted. This is done in the ravines, which, if too far off, are substituted by pieces of ground in the vicinity of the spot where the plants are required. When ravines are adopted, care is observed to select those which are shaded by trees not prejudicial to the coffee plants. On ground where there are no trees, the plants are shaded to the height of 4 feet with palm leaves, in a manner to admit the free circulation of air. After the ground is made loose and fine, young plants just opening, or berries only just ripened, are planted or sown at the distance of 4 inches apart each way. At the end of November or beginning of December, where the nurseries are kept free from weeds and occasionally watered, if necessary, the plants are about a foot high, with four or five leaves to each, when they are in a fit state for transplanting.

The distance between the coffee shrubs cannot here be definitely laid down, as it depends on the nature of the soil. On the most fertile forest lands, 12 feet by 12 is a good distance. On low and meagre soils, where the tree grows less luxuriantly and strong, 6 feet by 6 is reckoned the proper interval. All things being ready for transplanting, the ground in the nursery is cloven with a spade at the distance of an inch and a half round the stem of each seedling to about 3 inches in depth; then the plant with the ball of earth adhering is carefully lifted from the ground, and the ball wrapt in a large leaf, tied to prevent the crumbling away of the earth; but before it is thus taken up, the ground is moistened to cause the ball of earth to adhere. These seedlings, which, after the above operation, are called ball-plants, are then put in a bamboo wicker-frame, and carefully carried to the place where they are to be inserted in the ground. They are next taken out of the frames and planted in holes previously dug, at proper distances, each a foot broad and deep, filled with

fine, clean earth, an operation which must be performed at the beginning of the rainy season. There is always a plentiful supply of plants provided to make up for failures. It may further be observed, that when plants are placed in the nurseries, they usually do not have more than two off-shoots, or leaves, above each other, and when the ball-plants are removed, they are not more than a foot in height, as large ones always give meagre trees.

As soon as the coffee field is planted, the operation of supplying the dadap tree is commenced. The best variety has smooth, broad leaves, and quickly shoots. Thick young stems are chosen for cuttings about 3 feet long, with the lower ends pointed off. If they are moist or sappy, they are cut off twenty-four hours before planting. Between every two rows of coffee, one of dadap is inserted, not opposite the coffee plants, but alternately with them. Thus, if the coffee be 8 feet by 8 apart, the dadap will be 16 feet by 16. The dadap is planted to the depth of a foot with somewhat of a westerly inclination, in order that the morning sun may fall on the largest surface of the cutting. The ground is stiffly trodden round the bottom of the stem, and its upper part wrapt tightly with a leaf to prevent the sap from escaping.

For the first six months after planting, the coffee field is cleared of weeds every fortnight, and the ground well stirred. Those weeds which are too close to the plants to be removed by the hoe are pulled out with the hand. After the first six months, weeding is regarded as sufficient, if it take place once in four weeks, but this is persevered in till the third year, when there may be a much greater interval between the periods of cleaning. The dadap is also taken care of during this process, and is trimmed so as to grow upright, and to throw as much shade as possible upon the coffee without the plants touching.

In warm, fertile land, where the coffee plant grows rapidly, the trees are topped the third year; but this is done sparingly, and as a rule is not generally recommended, being only resorted to, to prevent its too rapid growth, or its running up to a point. Topping and taking off suckers are both necessary on meagre grounds, where the trees run much to wood, which prevents them from being injured in the picking season. The top or middle stem is broken off at a height of 6 or 7 feet, but care is taken not to lacerate the tree. As soon as the top shoots out again, it is lopped a second time, but the operation is seldom necessary more than twice. This lopping causes the tree to expand laterally and to put forth a greater number of strong twigs.

As soon as the estate becomes productive, just before the work of picking begins, the ground is kept exceedingly clear of weeds, and even swept with brooms, in order that the berries which may fall may be safely gathered up. The trees are carefully picked, row by row, each berry plucked off separately, to prevent the trees from being torn, and thus injure or retard the fresh offshoots. In gathering from high trees, light bamboo ladders are used.

When the berries are picked and brought into a village, they are

thrown into a heap, in the open air, and there left for twenty-four hours. Thus heaped up, they become warm, which creates a certain fermentation of the juice. This operation promotes drying and loosens the silvery pellicle, which surrounds the bean inside the parchment, which cannot be entirely got rid of in any other way. Those which still retain this pellicle are called in trade "groy coffee," and are sold at a lower price than the clean sorts. After fermentation, the coffee is spread out on platforms, in rather thick layers, and turned over twice a day. If it rain during the first spreading out, the coffee does not require to be sheltered, as the washing causes the juicy substance to evaporate, which afterwards accelerates the drying. In proportion as it becomes dryer, the thickness of the layer is reduced, and the turning is more frequent, until it is quite dry outside, and the pulp has become hard. It is then spread on drying floors, exposed to the powerful heat of the sun, where it can be easily and speedily covered in rainy or damp weather. This system of drying in the pulp requires six weeks or two months, as it is advisable not to be over hasty. When it is thoroughly dried, it is either "pounded" at once, or held in store for that operation.

Coffee cured in the pulp, as well as that in the parchment, before being pounded, is exposed for some hours to the sun to make it crisp and hard; but it is allowed to cool again before commencing the operation; otherwise, the beans would be liable to be broken. In order to know whether the coffee is sufficiently dry for pounding, a quantity is taken in the hand, gripped close, and held at the ear, and if the beans rattle freely in the pulp, they are in proper condition. They also try them by biting the berry, to ascertain whether the bean and pulp are both brittle and crisp. The pounding is done in small baskets of a conical form, about 2 feet high, a foot in diameter at the bottom, and 18 inches at the top. These baskets are fastened on the ground between four thick bamboo poles. They are not more than half filled with coffee at a time, the pounding being done with light wooden pestles, after which the baskets are lifted from between the poles, and the contents thrown into sieves, and cleaned from skin as well as from white, black, or broken beans. The coffee is now usually put up immediately in bags to preserve its peculiar greenish color; but if it is not sent directly to the packing stores to be bagged, it is put in a dry place and turned over once a day, to prevent heating, which damps and discolors the berry.

D. J. B.

ON THE PRODUCTION AND MANUFACTURE OF ARROW-ROOT IN THE SOUTH.

[Condensed from a paper read before the American Pharmaceutical Association, by Robert M. Batty, of Rome, Georgia.]

To the inquiry, "To what extent is the fecula of Maranta arundinacea produced in Georgia, Florida, and other Southern States, and

what impediments prevent its being made to rival that of Bermuda in excellence and beauty?" I desire to submit the following reply:

The production of arrow-root is, for the most part, confined to those who grow it for their own family use, and offer for sale only small lots which may chance to exceed their wants in favorable seasons, when the yield is large. Colonel M. Hallowes, of St. Mary's, is the only individual within my knowledge who makes it a regular staple crop, and it is to him and to Mr. James Hamilton Cowper, of St. Simon's Island, that I am chiefly indebted for such information as I shall be able to communicate, as also for many handsome samples of the fecula, and a drawing of the rasping apparatus used in its manufacture, all of which are herewith respectfully submitted. For the reason above stated, it has been out of my power to offer any reliable estimate of the extent of the production in this country, quite a large proportion of the aggregate being consumed upon the estates, and does not enter the market. Costing no actual money expended, the consumption of it as a dietetic article is unrestrained, and it supplies the place, in great measure, of corn starch, farina, Irish moss, gelatine, and even rice and flour, in the preparation of delicacies for the table, as well as the invalid's chamber. My friend, Dr. J. C. Le Hardy, of Savannah, writes: "Our druggists buy it (Georgia arrow-root) every year, in quantity, and prefer it to other kinds. They purchase mainly from one individual, near St. Mary's. The estimated quantity bought last year, in this city, is 2,900 pounds, as reported by the different drug houses engaged in the trade. Besides the principal grower alluded to, they trade with small planters, in quantities varying from a few pounds to one hundred weight."

Mr. James Hamilton Cowper writes: "It affords me pleasure to give you any information in my power on the subject of the growth and manufacture of the Maranta arundinacea, or Bermuda arrow-root; but I regret that my knowledge of the subject, although running through forty years, has been on so limited a scale, as to prove merely that an excellent article, in every respect equal to the best Bermuda, may be made on the seaboard of Georgia, with a very simple apparatus, and to an extent adequate to all the culinary and medicinal wants of a family. As respects its profit, as a crop, I am unable to give an opinion; and on this point, must refer you to Colonel Hallowes, as our best and only authority. He has gone largely into the field culture, and has erected extensive buildings and machinery.

"The cultivation of the arrow-root is precisely that of the sweet potato. A rich, fresh, sandy soil, a large, full bed, the seed (roots) placed 6 inches deep, and a foot apart, careful hoeing and keeping the bed up, constitute the culture. The seed-roots should be planted as soon as the spring is confirmed—with us about the middle of March. The smaller tubers or roots are to be selected for seed, and are best preserved by placing 10 to 15 bushels in a conical heap, stacking closely around them a layer of corn-stalks, and placing over the whole a coating of 2 or 3 inches of earth. The object is to keep up a uniform temperature, and to avoid dampness, and the extremes of

heat and cold. The plants are allowed to grow until the leaves and stems are slightly affected by the frost; the roots are then to be dug as potatoes, the larger selected for manufacture, and the smaller for seed. Those intended for manufacture, are to be stacked in heaps of 20 to 25 bushels, in the same way directed for the seed-roots. They must be carefully protected from cold, as the fecula is changed by freezing.

"The following is the mode of manufacturing for family use: The roots are washed, the scales on the outside removed by hand with a knife, and then again washed and placed in a tub of pure water. The next operation is to rasp down the roots, by pressing them, endwise, against the circumference of the rasping machine. This machine (Pl. VI.) consists of two wooden disks, framed as large pulleys, about 3½ feet in diameter, placed 6 inches apart, and covered with strong tinned iron, punched from within like a coarse nutmeg grater. It revolves around a central axis of wood, with as great a velocity as can be given without throwing off the water from its circumference. A large trough is placed under the wheel, which is kept nearly full of water; the wheel dipping into the trough about 6 inches. As the wheel revolves, the grated pulp is washed off into the trough, and when it becomes too thick, the mass is passed into a large tub, and the trough refilled with fresh water. The pulp collected in the tub is then pressed by hand until the fecula is separated from the fibre, and after removing the latter, the fecula is allowed to settle to the bottom. The next and most important operation is to pour off the water from the sediment, and when the latter has become pretty firm, to break it carefully into cakes, and with a knife blade, to remove from the bottom all sand and other impurities. The cleansed portion is then to be resuspended in a tub of pure water, allowed again to settle, again dried and cleansed. This operation must be repeated until the fecula settles in a *perfectly white and clean cake*. On the careful performance of this part of the manufacture depends the excellence of the article. The cakes are next to be broken up and placed upon cotton cloth stretchers until thoroughly dry and pulverulent, when the powder should be firmly packed in boxes or barrels. Air-drying in the shade is preferable to sun-drying, and dust must be sedulously avoided. Whatever the scale of manufacture and the machinery used, the essential points are—First, maturity of the roots. Second, cleansing the roots before rasping. Third, rasping so as completely to separate the fecula from the fibre. Fourth, separating the fecula from sand and all other impurities by frequent agitation and subsidence. Fifth, thorough and careful drying, to avoid mustiness or mildew. Sixth, packing so as effectually to exclude the air.

"The principles of separating fecula being the same, any labor-saving machinery adapted to the manufacture of potato starch may be applied to arrow-root. On a large scale, there would be great economy in driving several rasping machines by an engine, agitating the feculent mass from the rasper in large vats, filtering through

cloths, drying by hot air in large buildings furnished with cloth stretchers, &c.

"I give you the results of two experiments carefully made by me, to show how much fecula may be produced in this climate; a longer season and greater maturity should give more.

"1*st Experiment.*—Thirty-one heaped bushels of roots, averaging 43 pounds the bushel, being manufactured in the way above described, yielded 178 pounds of dry arrow-root starch, being $5\frac{3}{4}$ pounds to the bushel, or $13\frac{1}{3}$ per cent. of the weight of the roots. One hundred pounds of sweet potatoes manufactured in the same way, yielded 12 pounds of dry starch.

"2*d Experiment.*—Laboratory scale, carefully made, an untrimmed

arrow-root, washed and dried	995	grains.
Skins and ends	93	"
Weight of cleaned root	902	"

Being grated, washed, and prepared in the usual way, it gave of

clean dry starch	132	grains or	13.26	per cent.
Clean and dry fibre	42	"	4.23	"
Skins and ends	93	"	9.35	"
Water and loss	728	"	73.16	"
	995		100.00	

"This, to a bushel of roots weighing 43 pounds, is 5.7 clean, dry fecula. The yield of roots, of all sizes, to the acre, is from 100 to 150 bushels.

"I send you a specimen of the arrow-root of my last year's manufacture. That made in this neighborhood is considered in every respect fully equal to the article made in Bermuda. With the same skill and care in the manufacture, I have no doubt that as good an article can be made on the coast of Georgia and Florida as in any part of the world. The quantity is probably greater under the tropics.

"I use tinned iron for the rasping part of the mill, and wooden vessels for washing and precipitation. Perfect cleanliness is required in every operation.

"I send you a sketch drawn by one of my sons, of the rasping machine—*i i* wheel-rasp, covered with strong tinned iron coarsely punched, the rough projections turned outwards, and the sheets nailed on, overlapping in a direction opposite that of the movement of the wheel; *b b* frame of wood; *e* trough partly filled with water, and sloping towards tub *k;* as the trough receives the pulp, the excess of water runs over a notch in its end, as shown. A plug is placed at the bottom for emptying it. *a*, hopper in which the cleaned roots are placed, and pushed forwards by a board held in the hand."

In reply to questions propounded, I have the following from Colonel Miller Hallowes, near St. Mary's, Georgia:

1. *What is your usual crop?*

"In reply to this, I send you a statement of my crop of arrow-root, with products in roots or tubers, and the prepared article for several successive years."

2. *Can you give me any estimate of the crops of other growers in your vicinity, or elsewhere, at the South?*

"I cannot. I believe it is cultivated on many plantations, on a small scale, merely for the use of the plantations. In Florida, immediately opposite St. Mary's, there were two persons who formerly cultivated it for sale, but their crops, I believe, did not exceed a few hundred pounds. Of the quality of the article made by them, I know nothing, but believe it was good. I do not know whether they now continue to make it. Some years since, Dr. Payne, of Micanopy, Florida, visited me for the purpose of getting information upon the manufacture of arrow-root. I gave him all the information I possessed, showed him my machinery, of which he took notes, and I understand commenced the business, having purchased a small steam-engine for the purpose. Of the result, I am not well informed, but have heard that he soon discontinued it. On the Miami River, South Florida, a large business was carried on by a gentleman named Ferguson, in the manufacture of *coonti*, or *coontee* (the Indian name, I believe). This plant is indigenous to that part of Florida, growing in the greatest profusion, and requiring no cultivation. It is dug and manufactured, I presume, in the same manner with the genuine arrow-root. Before the late Indian difficulties in Florida, I am told that large quantities of this preparation were sent to the North, under the name of Florida arrow-root. I have seen the fecula, which appears to be good, but have not made any special examination of it. Unquestionably, the plant is not the Maranta arundinacea, the two plants being entirely distinct, of which fact, I had an opportunity of judging, through the kindness of Dr. Payne, who sent me some roots of the coonti, which grew for some years in my garden. In the new American Encyclopædia, the *coonti* is described as a species of sago palm.

3. *Do you regard the Maranta as a certain and reliable crop?*

"This question will be best answered by referring again to the statement I send in reply to the first question. I will, however, add, that, like all other plants, its product depends much on the season. If the plant is checked by a long drought, or a very cold and wet spring, soon after it comes up, it is long in recovering, and perhaps never entirely recovers. If the young plants get a good and early start, they stand both drought and wet well. Much also depends on the way in which it is cultivated. Like cotton, it is bedded, and like which, after the bed is formed, it should be as little disturbed as possible, merely removing earth sufficient to destroy grass or weeds, and adding a little fresh earth."

4. *To what accidents and uncertainties is it subject?*

"Geese are its inveterate enemies. When I commenced its culture, on going into the field, soon after the young plants had come up, I observed to my horror that the plants on several rows were lying

upon the ground in regular order, having been pulled up by the geese. They seemed to have worked very methodically, each goose taking its own row, and not leaving a single plant in the ground. They did not eat the plants, and mischief, I believe, was their sole object. The geese were sent off, and I have kept none since. The common fowl and chickens injure the plant, while young, by picking the leaves, and even sometimes destroy it. Two or three times, I observed, in autumn, a considerable number of caterpillars among the plants, which ate the leaves and finally wound themselves up in them, by drawing the leaves around them with a few filaments from the cocoon. The moth, in due time, came forth, but I have not observed a second crop of caterpillars. I do not think they have done me serious injury, but successive hatching undoubtedly would. The grub grows to a large size, nearly if not quite 2 inches long, is green, with a reddish-brown head, quite large in the middle of the body, tapering in an unusual manner towards each extremity. I have not seen it elsewhere."

5. *Does it bear light frosts?*

"I do not think that the plant is materially injured by our spring frosts, when not severe, but is simply checked in its growth. Our autumnal frosts, when not too severe, I think are rather beneficial than otherwise, checking the growth of the plants, and causing the tubers to increase rapidly in size. It is advisable to dig the roots before a heavy black frost occurs, as in that event, the roots near the surface are apt to be touched, becoming useless, and if banked with the sound roots will cause them to decay. I have them banked in the same way as sweet potatoes, covering them thickly with earth to prevent their sprouting. I think it would be preferable, to put them in houses constructed similar to what is here called a 'potato cellar.'"

6. *Is your plant the Maranta arundinacea?*

"It is. I have two kinds, the only difference being that one grows much taller than the other, bearing tubers of greater length, the joints of which are much longer. I give the preference to the smaller plant, with short-jointed tubers, as it is more easily dug, and less likely to break in digging. The long tuber penetrates much deeper into the ground, and might, in a very dry season, produce better upon that account. The fecula from both is identical."

7. *What is the product to the acre?*

"I again refer you to the statement of my crops. I think I may safely say that 5 pounds of fecula to the bushel of roots is a fair estimate when it is made on a large scale; when worked with great care, it will undoubtedly yield a larger quantity. There is considerable waste in making it upon a large scale, which I have found unavoidable, although I have taken great pains to prevent it. Much depends upon reducing thoroughly the roots to a perfect pulp, breaking every cell, for which purpose I have used many kinds of graters, from those of punched tin or sheet-iron, to graters of straight saws and circular saws. I should give the preference to the punched graters, as the most efficient, if they did not so soon become dull. I

have tried a double set of iron rollers, which, however, have proved a failure. In the Island of St. Vincent, they use two sets of brass rollers, and successfully, according to Dr. Ure. I think I could, by some alterations, make the rollers answer, but it would be a costly experiment.

"Digging the roots is a slow and tedious process. I have tried the plough without success. If the hoe is used, many of the roots are cut. For several years, I have used an implement with two long stout prongs, set into a handle, like a hoe, which, by striking well into the ground and forcing the handle from you, loosens the plants in the bed, which are then pulled out by hand; most of the tubers adhere to them if they (the plants) have not been killed by frost. The hole, from which the plant is taken, should be examined for any roots, which may have been left behind. The tubers diverge in all directions from the plants, hence the difficulty in digging, and danger of cutting them with the hoe. The pronged hoe will sometimes penetrate them.

"There is no secret in making arrow-root. The great requisite, after the roots have been well washed and reduced to a fine pulp, is an abundance of water, together with great cleanliness, and until the hands are well trained, the constant vigilance of the master. The latter is more or less necessary at all times.

"The pulp is passed at one operation through three sets of sieves, of different degrees of fineness, put into motion by machinery, and using an abundance of water. As it is strained, the fluid runs into vats, where it is allowed to settle, water drawn off and fresh water added, stirring up the sediment thoroughly. This process is repeated a second time, and it is then strained through sieves of the finest bolting cloth, again washed with sucessive portions of water, allowed to settle in tubs, water decanted, and the tubs removed to the drying house, where the fecula, when settled into a solid mass, is broken up and placed on frames of convenient size, covered with cotton shirting, which are carried into the drying room, heated artificially, and allowed to remain eighteen to twenty-four hours, taken out, allowed to cool and put into bins ready for packing. I use boxes containing about 100 pounds each. In the course of the process of the manufacture, I have attempted to describe. 5,000 gallons of water are used daily, all of which is furnished by a well of the purest water, not exceeding 12 feet in depth."

I do not think my arrow-root has the pearly appearance so peculiar to that of Bermuda, which the latter may perhaps receive from being made with tank water, (I am informed that tank water is used in preparing it,) or it may proceed from the more perfect maturity of the plant, which, according to Ure, requires eleven months in the Island of St. Vincent. One thing is certain. that my arrow-root is much drier than the Bermuda and keeps much longer. I send you small samples of fecula of the crops of several successive years, which have been kept without any particular care; some in tin cases, others simply in paper in a drawer. Some years ago, I sent several boxes, containing 100 pounds or more, each, to New Orleans. The gentleman to whom it was sent having received an appointment abroad

before it was sold, consigned it to a druggist in the city, by whom it was placed in a damp store-house, where it remained, I think, nearly or quite a year; and being still unsold, I ordered it to my agent in New York, who sold it before arrival, on condition that it was sweet. It arrived in perfect order. My entire crop is now annually engaged to a single prominent drug house in Philadelphia, after supplying my old customers in Savannah, Charleston, &c.

Statement of crops of Colonel Hallowes.

GROUND PLANTED.				ROOTS DUG.	Product in fecula.
Years.	Acres.	Tasks.	Rows.	Number of baskets.**	
1846*	......	......	......	....	5,300 pounds.
1847*	......	......	......	....	8,900 "
1848*	......	......	......	....	12,500 "
1849†	33	3	12	2,144	20,000 "
1850	34	3	16	1,058½	8,800 "
1851	40	3	20	1,169	8,600 "
1852	34	3	16	1,213	14,160 "
1853	46	1	30	724¾	8,000 "
1854‡	48	1	7	1,114	6,400 "
1855	51	1	18	705¼	6,986 "
1856§	56	3	20	300¼	2,500 "
1857‖	16	3	8	472¼	5,324 "
1858¶	35				

"The difference observable in the fecula in proportion to the quantity of roots manufactured, is to be attributed in a great measure to the imperfect reduction of the roots to a fine pulp, owing to the different kinds of graters used. Thus, in 1856, from 300 quarter baskets of roots, I only made 2,500 pounds, and in 1857, from 472 quarter baskets, I more than doubled that quantity. In 1856, I used graters of circular saws, which chipped the roots and did not sufficiently break the cells. In 1857, I used circular graters of straight saws, which I think much more efficient. Reducing the tubers to a perfect pulp, in my opinion, is the most important part of the whole process. I am not yet perfectly satisfied with any of the methods

* Portion of memoranda mislaid.

† A considerable portion of this year's crop planted on hand recently purchased, which had been "cow-penned" by former owner.

‡ If I remember right, tubers injured by frost, large quantities being decayed in the banks.

§ Seed decayed in the ground.

‖ Short of seed; part of ground manured.

¶ Crop yet in the ground.

** Tubers when dug were measured in baskets differing a little in size, but would average 1½ to 2 bushels each.

which I have used. Unlike the potato, wheat, &c., from which starch is made, the arrow-root is very fibrous, which renders it difficult to break the cells containing the fecula, so as entirely to set it free. If I were making a small quantity, I should prefer graters of punched tin or sheet iron, turned by hand, but I have not found them to answer with a rapid motion, as they soon became dull, and even indented by pressing the roots against them. If they could always be presented endwise to the grater, much of the difficulty would be obviated; but this I have found almost impossible, as in feeding rapidly, some of the roots (which have a highly enamelled exterior) will be presented sidewise, and more or less chipping and dragging small thin pieces through is the consequence."

The specimens of arrow-root presented by Colonel Hallowes, taken together, show, clearly, a superior keeping quality; there is a degree of freshness about all of them quite commendable. The coonti mentioned by him is doubtless the fecula of Zamia integrifolia; there is also a fecula formerly prepared and used by the Florida Indians, from the Chamærops serrulata, or saw palmetto.

In conclusion, the question naturally presents itself, Why is it that we are not furnished from our own seaboard with a full supply of excellent arrow-root? This question I am unable to answer satisfactorily, yet it occurs to me that its manufacture is not well suited to the genius of our people, taken as a mass. Could we but transplant a colony of New England Shakers upon our soil, we would, I think, soon find Georgia arrow-root driving all other varieties out of our market.

VITALITY OF SEEDS.

BY LEVI BARTLETT, OF WARNER, NEW HAMPSHIRE.

In the "Irish Farmers' Gazette," of the 6th of November, 1858, there is an article on the vitality of seeds, from which I make a short extract. It says: "The practical man knows that there are many agricultural and garden seeds that very quickly lose their vitality; amongst those may be named peas, beans, vetches, and onions, which rarely preserve their powers of germination till two years old. On the other hand, there are many seeds which not only remain good when properly kept, but improve for practical purposes. The gardener knows that melon and cucumber seeds, if used of the last year's saving, produce plants too vigorous to produce much good fruit; whereas, those kept over for several years produce less rambling, but very fruitful plants. He also knows that cabbage, turnips, cauliflowers, broccoli, &c., keep well for several years, when excluded from sudden changes of temperature, and are more to be depended on in producing those varieties in perfection than those of more recent production."

In a letter, dated June 21, 1858, to the Commissioner of Patents, the writer says, in reference to the turnip seed imported by the Patent Office, that "It must always of necessity be one year old when planted, whilst the American ripens in season for sowing the same year—a matter of much consequence at the South."

From the above quotation, it would naturally be inferred, that turnip seed, when one year old, was not safe to plant at the South. But the editor of the Irish Farmers' Gazette says "that cabbage, turnip seed, &c., keep well for several years, and are more to be depended on in producing those varieties in perfection than those of more recent production." Now, what is true in reference to this matter in Ireland, is also true in New Hampshire.

In the spring of 1854, I received a large package of colsa, or rape seed, from the Patent Office, a portion of which I sowed in June, of that year, again in 1855–6–7–8. All the seed, sown in these several years, was from the original package. I think they did not germinate quite so freely the past season as in previous years; but there was a full supply of plants, and I never grew heavier ones. The seed was probably of the growth of 1853.

In the spring of 1855, I received a package of Milan cabbage seed, a superior variety of Savoy. I raised plants, and grew fine large heads, from this package in 1855–6–7–8. They were as good as the past, as in any previous season, and true to their kind. I have frequently sown seeds of cabbage and turnips, when two and three years old, with success.

From the foregoing statements, I think farmers and others, wishing to grow for their own use cabbage and turnip seed, "true to their kind," can derive some practical hints which may be of value to them. The tendency of different varieties of the brassica tribe of plants to mix or hybridize, while in blossom, is well known. It is almost impossible to raise pure seed, if different varieties of cabbage and turnips are planted out for seed, in a small garden, or in the vicinity of each other. Insects will transmit the pollen from one variety to another, while in bloom, and seeds producing hybrid plants will be the result. To prevent this mixing of plants, a person one year might set out for seed enough Savoy cabbage to grow seeds for several years' sowing; the next year, he might grow the Early York, or other favorite kind. So of different varieties of turnips, the seeds should be put in suitable bags, labelled with the name of the variety, and the year in which they were grown. Frequently, persons purchase much more cabbage and turnip seed than they sow that season. If new and good, when purchased, they will keep good for one or two years. For I have shown that rape seed vegetated well when at least five years old, and the Milan cabbage when four or more years old, and doubtless other varieties of the brassica tribe will produce seeds which will retain their vitality equally long.

PROPERTIES AND USES OF THE CORK TREE.

The cork oak, (*Quercus suber*,) recently introduced into the United States, is a native of the south of Europe and the north of Africa, sometimes growing to a height of 40 or 50 feet, with a trunk as many inches in diameter, well known as being the only tree producing an important article of commerce, from which it takes its name. Like many of its congeners, it varies exceedingly in the magnitude, form, and margins of its leaves, and also in the size of its fruit. The acorns, which are sweet, may be used as human food in cases of necessity; and the Spaniards of the present day roast and eat them in the same manner as they do those of the Quercus gramuntia, and as we do chestnuts. Swine, also, greedily devour them, and rapidly fatten upon this nutriment, in the forests of Spain, producing a firm and very savory lard. The outer bark, the great thickness and elasticity of which is owing to an extraordinary development of the cellular tissue, forms the cork, which, after the tree is fully grown, cracks and separates from it of its own accord. The inner bark remains attached to the tree. If removed in its young state, it is only fit for tanning. Both outer and inner bark abound in tannin, and the former contains suberic acid, as well as a peculiar principle called *suberin*.

Cork tree in Fulham Nursery, near London, thirty-four years planted.

This tree, as found in a wild state, in dry hilly places, does not usually exceed a height of 20 or 30 feet; but in Britain and Ireland, where it has long been cultivated with care for the purpose of ornament, it attains its utmost dimensions. The largest cork tree, perhaps in the world, is one in Devonshire, at Mamhead, exceeding 60 feet in

height, with a trunk some 13 feet in circumference at a foot above the ground. It stands in the middle of the Park, in a soil of fine, rich, red loam, on a substratum of red conglomerate. Its head is oval and compact, and its grand massive branches, each of which would form a tree of noble size, are covered with rugged, corky bark, resembling richly-chased, frosty silver, finely contrasted with the luxuriant foliage which is of a dark evergreen. One of the handsomest, though a much smaller tree, is that in the Fulham Nursery, in the neighborhood of London. At the age of thirty-four years, it had attained the height of 27 feet, with a trunk 24 inches in diameter, at a yard above the ground. A portrait of this tree is presented in the preceding cut.

The wood of this tree, weighing 84 pounds to a cubic foot, may be employed for similar purposes as that of other oaks; but as it is rarely found of sufficient size and abundance to be of much consequence, it is but little used in the arts. By far the most important product, however, that this tree yields, is its outer bark, which, as above stated, forms the cork of commerce. A contract was made some years ago, in Spain, with the government for the extraction of a quantity of the finest cork from the Sierra de Morena, near Seville, the contractors being compelled to take the inner bark as well as the outer, the stripping off of which is known to kill the tree. The inner bark being of no use, except for tanning, was found an incumbrance to the contractors, who had no demand for it. Thus government, for a temporary gain, occasioned a national loss of a prodigious number of valuable trees.

It has been observed that the bark of the cork oak, separated from it naturally, is of little value as compared with that removed by art; and the reason, doubtless, is, in the latter case, it has not arrived at that rigid, contracted, and fractured state, which is the natural consequence of its dropping from the trunk. When the tree has attained an age of about fifteen or twenty years, the bark is removed for the first time; but this crop is found to be cracked and full of cells and woody portions, and is therefore only fit for tanning or burning. The cork is separated first by making a circular cut round the trunk, directly below the main branches, and another at a few inches above the surface of the ground. The portion of the bark intervening between these two cuts is then split down in three or four places, care being taken, both in making the circular and the longitudinal cuts, not to penetrate the inner bark. This operation, in the south of Spain, is commonly performed in July, or in the early part of August, when the second sap is plentifully flowing. The tree is now left for eight or ten years, when it is disbarked as before, although the bark may not even have acquired the desired perfection for the manufacture of corks, and hence is sold to fishermen to buoy up their nets, and for other inferior uses. By the expiration of eight or ten years more, a third disbarking takes place, when the cork is found to possess the requisite thickness and quality. From this time, as long as the tree exists in a growing state, which may be two or three centuries, its disbarking may be performed every eight or ten years,

the quality of the cork improving with the increasing age of the tree, and itself uninjured by the deprivation. The instrument for cutting and separating the bark is a sort of an axe, with the handle flattened into a wedge-like shape at the extremity, serving to raise the bark after the circular and longitudinal cuts have been made.

The cork, when first removed is in laminæ, more or less curved, according to their breadth and the diameter of the tree. To deprive them of this curved form, after being scraped on the outer side, the coarse parts of the epidermis and any moss or other parasitic plants are removed, they are held over a blazing fire till the surface becomes scorched, and then laid flat on the ground, and kept so for some time by large stones. This gives them a "set," or form, ever afterwards retained, thus becoming in a fitter state, not only for packing and transportation, but for manufacture. The slight charring, produced by scorching, closes the pores of the cork, and gives it what cork-cutters call "nerve." The best cork, which is not less than 1¼ inches in thickness, is supple, elastic, neither woody nor porous, and of a reddish color, known in France as "velvet cork." Yellow cork is considered of inferior quality; and white cork, or that not charred on the surface, is regarded as the poorest.

In studying the history of this singular though common article, it appears that it has been applied to economical purposes for centuries, even in the time of the Romans. Pliny mentions a kind of buckler lined with cork, and that the Roman women lined their shoes with it, the latter being a practice common throughout the civilized world at the present day. According to Columella, it was employed for making bee-hives, which were regarded as proof against the heat of summer, as well as winter's cold. It is also used, at present, for the same purposes in Barbary, Spain, and its Provinces, by making choice of the bark of young cork trees, rolled into cylinders, secured with hoops, or sewed. On the island of Teneriffe, the inhabitants transport their bees in cork hives to a distance of several leagues, at the season of the bloom of the "retama," *(Spartium nubigenum,)* a beautiful arborescent heath, growing around the flanks of the peak, amidst the clouds, at an elevation of 5,000 or 6,000 feet above sea-level, that they may extract the nectar of the flowers, and also to prevent them from puncturing the grape, which is about to mature at this period. The ancient Greeks, as well as the Romans, appear to have used this substance for stoppers to vessels; but it was not extensively employed for this purpose till the seventeenth century, when glass bottles, unmentioned before the fifteenth century, began to be generally used. In modern times, besides the employment of cork for stoppers of bottles and bungs to vessels of various kinds, for lining the soles of shoes, and numerous uses, it is made a choice of by fishermen for supporting their nets, and by anglers for trolling and other kinds of fishing. It is also employed in the construction of life-boats, as well as for what are called "life-jackets," to enable persons to float who cannot swim. In the Province of Valencia and other parts of Spain, where rice is cultivated, it forms that portion of the machinery which comes directly in contact with the grains in

the process of abrading or polishing their surface. The poor people of that country lay sheets of cork by their bed-sides on the earthern floors, to tread upon, in the manner we use rugs and carpets, to defend our feet from the floor. They also sometimes line their houses, when built of stone, with this bark, which renders them very warm, and corrects the moisture from the walls. When burned in close vessels, it forms the powder sold in the color-shops under the name of "Spanish black."

There are various other uses to which the bark of the cork tree is applied in its organic state. Its most valuable property, and that which is almost peculiar to it, is its imperviousness to any common liquid; while, at the same time, it is light and porous, and consequently one of the best non-conductors of heat. Add to these qualities its compressibility and elasticity, and we have a substance unequalled either in Nature or by art. Its non-conducting properties, flexibility, and elasticity render it particularly adapted for lining articles of dress, or the walls or floors of rooms. Its lightness and imperviousness to fluids fit it, in a superior manner, for life-preservers, either in the form of boats, or articles to be attached to persons to enable them to swim; and its compressibility, united with elasticity, taken in connection with its imperviousness to liquids, and its great durability, render it the best of all known substances for stopping bottles, forming an article of commerce throughout the civilized world. For this latter purpose, as an essential accompaniment to the future wine-culture of the United States, there will undoubtedly be a special and an increased demand.

There is nothing peculiar in the culture of the cork oak after planting the young trees, except that they be pruned, so as to have a clear stem of 10 or 12 feet in height, on which the cork is afterwards to be produced. The acorns designed for propagation, usually ripe in October, must be buried in moderately dry earth, well drained, immediately after they fall from the tree, and planted the spring following, with their small ends downward, about one-fourth of an inch below the surface, either in the nursery or in the sites where they are permanently to remain. Whenever it is desirable to transport them to a distance, either by sea or on land, through warm climates or cold, it can safely be done by soldering them up hermetically in small metallic cases, with about their own bulk of garden soil, sufficiently moist, but friable, for ordinary cultivation. I have repeatedly opened cases of this sort in the month of June, which had been closed in the south of Europe the autumn preceding, and found the acorns in excellent condition, most of them in a growing state. When thus vegetated, however, they must be planted at the moment they are exposed to the air and light, as otherwise they would lose their vitality.

D. J. B.

GRAPE AND WINE-CULTURE.

THE GRAPE AND WINE-CULTURE OF CALIFORNIA.

BY ANDREW W. M'KEE, OF SAN FRANCISCO.

The following article upon the Grape and Wine-Culture of California, together with other remarks upon the climate, soil, and agricultural prospects of this State, is derived from the most reliable and authentic sources, and from persons of known veracity and integrity, prominent among whom may be mentioned William Wolfskill and Colonel J. J. Warner, for many years residents of Southern California; also John G. Downey, Collector of the Port of San Pedro, and the official Report of the California State Agricultural Society for 1856 and 1857.

The history or origin of the grape in California is derived from the records of the "Missions" which were mainly established by the San Franciscan Monks, in different sections between the present limits of Sonora to near Oregon, from the years 1769 to 1820. The "Fathers," who were selected to locate and establish the Missions, were men noted for their energy of character, skill in mechanical arts, and agricultural knowledge—the primary object being to civilize and christianize the savage tribes, while the crown of Spain, through their Viceroy in Mexico, with a view to colonize the west coast, gave them most liberal grants of excellent land, only requiring that they should keep records of their observations upon the climate, soil, productions, &c., and teach the natives how to raise cattle and to till the soil. With this view, the Fathers seem to have faithfully applied themselves, and to them are the present inhabitants of California indebted for the introduction of some of the choicest fruits now grown here, among which are the grape, pears, oranges, lemons, limes, figs, olives, almonds, apricots, &c. From the records as above, we learn the following in relation to the history of the California grape. Although Upper California was well supplied with indigenous vines, no variety was found that matured a sweet fruit. The Fathers, therefore, soon procured from Lower California and commenced the cultivation of the Vitis vinifera, now known as the "California grape," which had been introduced into that Province from the Island of Madeira by the Spanish government, and there successfully cultivated by the Jesuit Missionaries, who established themselves at San Dionisio, in October. 1697. From thence, cuttings were brought to the territory of Upper California, and planted at the Mission of San Gabriel, situated in the present county of Los Angeles. This grape is sometimes called the "true wine grape." The White Muscatel was also introduced into Upper California, but not being so great a bearer as the other, was never extensively cultivated. In most of the Missions which had vineyards, there were Muscatel vines, and in some they

amounted to a thousand or more. A small quantity of wine was made from them, but they were not much esteemed, nor cultivated, except as an early table grape. The Mission of San Gabriel, eight miles east of the city of Los Angeles, was founded in 1771, two years after the establishment of the Military Post and Mission of San Diego, the first settlement formed in Upper California. The vineyard of San Gabriel, until it fell into decay from neglect, was popularly known as the "viña madre," (mother vineyard,) from the fact that all the vineyards of Upper California were derived from it.

This California grape, commonly known in Spain as the "Alicante," is of a black color, and is properly a half-hardy variety. It is exceedingly well adapted to the climate of all the valleys in this State, but is not sufficiently hardy to endure the severe freezing of northern winters. It would probably thrive as far north as the Carolinas, but scarcely in Virginia, unless covered in the winter. This grape is cultivated somewhat extensively at El Paso, in latitude about 32°, and at Santa Fé, 36° north; but at both places the vines must invariably be covered in winter with earth, above the pruning point. At the former place, the fruit attained great excellence, and was cultivated with success many years; as the "Fathers" there say, without a failure in seventy years. On the Pacific coast, however, where the isothermal line diverges to the north, it grows in the open air as far up as Southern Oregon, say from 40° to 44°, and needs no protection whatever during any portion of the year; but, in California, north of San Francisco, as a general thing, it does not acquire the sweetness it does south of that city, especially in Los Angeles county, the grapes of which have a distinctive fame throughout our State. As a table grape, it is not surpassed, and hardly equalled in the world for richness and purity of flavor. In size, shape, color, and aroma, it nearly resembles the "Black Hamburg," as grown in the Eastern States under glass. To those who prefer a higher aromatic, or musky flavor, the White Muscat of Alexandria, or the Muscatel, might be recommended for the table, as well as for their color; but they are certainly not sweeter nor more luscious than the grape of Los Angeles. Many of the modern varieties of the grape have been introduced into our State within the past ten or fifteen years, but none as yet, have equalled the California, described above, as a rich wine grape, although some of them may be better adapted to the production of the different classes of light wines; but this has yet to be tested by experiment. To make a lighter wine with the same grape. having less body, but still wholesome, is the present object of our wine-makers. In the genial climate and sandy loam of the valley of Los Angeles, the California grape secretes saccharine matter in such quantities that its wine has, perhaps, too much body, and many persons object to it on that account; but this, with more experience, will doubtless be obviated. By taking due care in removing the stems and bad grapes, when gathered, a wine resembling Port (here called "California Port") has been produced, which is believed to be the richest and finest of that class, extant.

The Catawba grape has been well tried in California, but it is found

that neither our soil nor climate will deprive them of that harsh and insipid pulp which they seem to inherit from their parent, the "Fox grape."

With regard to the preservation of the grape in California, not much has yet been done, which is attributable, however, to various reasons. It has been found more profitable to ship them to the cities and mining regions of the State, or to make them into wine. The same will apply to currants and figs.

To the efforts of the Agricultural Division of the Patent Office, California is indebted for the introduction of most valuable vines of the Zante grape, which produces the celebrated dried currants of commerce. These are growing and thriving exceedingly well, a most significant fact, when it is said that this variety of grape is rapidly failing, and great fears are entertained of its total loss in the country where it has hitherto been grown, the Islands of Zante, Cephalonia, &c. Should these fears be realized, and this grape reproduced, and brought to its pristine quality, in California, it is believed that the result to this State, alone, will tenfold reimburse the entire appropriations for that Office. Six hundred and forty-three vessels annually leave the Mediterranean for the Atlantic ports, loaded with figs, lemons, oranges, limes, almonds, and products of the vine, to the amount of $7,250,000, the total yield from the Mediterranean, for all countries, being over $200,000,000. It is merely a question of time, when California will supply her sister States with the above-named articles and still have more to spare.

In connection with the subject of the products of the vine, it will at once be seen that great importance will result to California, especially, as well as to Ohio, Indiana, Missouri, and all other States, where the grape is manufactured into wine, from the introduction of the cork oak, by the importation of the acorn from Spain, through the Patent Office. The invoice, or home cost of the cork bark, imported into the United States, amounts to over $250,000, annually, with a greatly increasing demand. This tree is found to grow and thrive remarkably well wherever planted in our Middle and Southern States, as well as those on the Pacific coast. It grows rapidly and attains a height of over 30 feet. The Patent Office has already imported enough acorns to plant more than half a million trees.

In Lower California, where labor is cheaper and the distance from market too great for the sale of fresh fruit, most excellent raisins are made from the large Malaga grape, and thus, with the California grape, we may expect, ere long, to have plenty of excellent raisins manufactured in our interior valleys. Certain it is, that our grapes lack nothing in richness of flavor nor abundance of saccharine qualities, to adapt them to such a purpose.

The cultivation of the grape, in California, is exceedingly simple, and attended with the most astonishing profits. The soil, as a general thing, is a rich sandy loam, which is ploughed, harrowed, and stricken off into rows, 6 feet each way. Some put them 7 feet asunder. A crow-bar is used to make the hole, and the cutting is inserted about 3 feet deep, leaving from 4 to 6 inches above the sur

face. In two years, the vines begin to bear. and abundantly, in from three to five. At what age they reach their maximum yield is uncertain, but the records of the Missions and living witnesses prove, beyond a doubt, that there are vineyards in this State from sixty to seventy years old, which are yielding as largely as ever before; nor within the period of seventy years has there been even a partial failure, although, within that time, the wine crops throughout Europe and other countries have been terribly afflicted, and entire annihilation threatened.

The ordinary calculation is that an acre of land, in California, is sufficient for a thousand vines, each of which, when in full bearing, will produce a gallon of wine. This is proven to be a safe estimate, but rather under than over the average. An experienced man, with the assistance of a horse and plough, for about eight days in the year, will attend and cultivate from 8 to 10 acres. The vines are generally pruned close, but not trained. In this manner, the yield is more abundant, the grapes sweeter, and produced more cheaply, there being no cost for staking, or trellising. The closer the bunches can be raised to the earth, in California, where it never rains during the summer months, the more benefit they receive from the radiation of caloric. Thousands of vines and cuttings have been sent from California to the Eastern States. Mr. N. Longworth, of Cincinnati, speaks of them as doing well in Ohio. A quantity has also been planted near Lebanon, Tennessee, in the open air, and is reported as doing well; and it is believed that, if a similar method of culture, with a little care in winter, were tried in Maryland, Virginia, North Carolina, Kentucky, and other States adjacent, this grape would prove highly profitable. As to the future prospect for the grape-culture, in California, it is ascertained beyond a doubt that there are now in full bearing two million vines matured, two million about two years old, and preparations, this year, are being made to put out at least three million more. The increase of vines from 1856 to 1858, only two years, has been more than doubled. The value of the grape crop in this State, for 1858, is estimated at $1,000,000. When the present stock of vines is well matured, it is estimated that their yield will be worth nearly $8,000,000.

Although there is not a county in this State, from Oregon to Mexico, where the grape will not flourish well, it is conceded that the three southern counties, Los Angeles, San Bernardino, and San Diego, which are about on an equality wherever localities are found susceptible of irrigation, bear off the palm for quality and quantity per acre; and it is fully ascertained that the capabilities of these counties, for the vine, with the present supply of water for irrigation, are equal to one hundred million vines, equivalent to 100,000,000 gallons of wine.

MANUFACTURE OF WINE.

The process of manufacturing wines, in California, is nearly as simple as the planting of the vines. The vintage commences in the lower portion of the State about the first of October. and generally con-

tinues from four to six weeks. The classes of wine generally made, at present, are, white and red wine, Port, angelico, champagne, and brandy. The white and red wines are made from the same grape; the former being the first and purest juice that runs from the press. It is immediately put into casks, and allowed to ferment. Usually in the month of February, when fermentation has ceased, and the wine is clear, it is drawn off into fresh, clean pipes. It is again drawn off, or racked, in June, and sometimes a third time in August. It seems to be a maxim among the wine growers here that wine should be racked off at least three times the first year, corresponding to the times when the vines are pruned, just before blooming, and when the grape is turning to ripeness—after that, as often as once a year.

The red wine is made from the last of the pressure of the same grapes from which the white wine is drained, and is allowed to ferment upon the pomace, or skins of the grapes, in open tubs, from four to six days, when it is drawn off and put into close casks, and then treated in the same manner as the white wine above described.

Port wine is made of the very best of the grapes, which must be of an equal degree of ripeness, and free from all imperfections. Although of superior quality, the high rates of labor here have thus far prevented it from being manufactured in large quantities.

Angelico is a sweet wine which is never allowed to ferment, only the choicest grapes being used in its manufacture. It is made by adding brandy to white wine, in the ratio of one to three, as it comes from the press. It is thus kept from fermentation, and always remains sweet. It is immediately put into close casks and drawn off, as soon as it is clear, which is generally within four to five weeks. The casks for angelico wine have to be prepared with great care by sulphuring. The treatment of this wine, after the first drawing off, is similar to that of the white and red wines. "Aguadiente" (brandy) only can be used in making angelico, as it has the true grape flavor, which most other brandies have not. This brandy is distilled from wine made from lees, or from the pomace of the pressed grapes. It takes about 5 gallons of wine to make one of aguadiente.

Champagne wine has been mainly manufactured by Messrs. Sainsevain Brothers, of Los Angeles county, who have met with most flattering success in the production of a superior article, which they appropriately call "Sparkling California." This wine is now constantly used in the hotels and restaurants, side by side with the celebrated brands of "Widow Cliquot" and "Imperial Cabinet" champagnes, as well as our clarets and wines of the Burgundy class. The two principal firms engaged in the manufacture and sale of Los Angeles wines and brandies, and the most extensive in the State, are Messrs. Sainsevain Brothers and Messrs. Kohler, Fröhling & Bauck, both of which firms are proprietors of extensive vineyards, with large and excellent wine-cellars at the vineyards and in the city of San Fancisco. The eight large cellars of Messrs. Sainsevain Brothers in Los Angeles county, filled with wine and brandy, present an astonishing picture of rapid wealth. It is apparent that it is directly the interest of the above-named firms to treat native

wine honestly and fairly. Messrs. Kohler, Fröhling & Bauck were the pioneers in this business, and to them, with Messrs. Sainsevain Brothers, are the principal wine-growers of California indebted for the present and prospective demand for brandy and wine. These firms not only use the grapes grown in their own, but they purchase largely the product of the neighboring vineyards, which can be had at a price that will leave a profit when made into wine. These gentlemen stand deservedly high in the estimation of our community, and both producers and consumers have great confidence in them. The bulk of the wine crop of Los Angeles county and district finds its way to market through these firms, or is stored in their cellars to acquire age. California wines are yet young, and it is the desire of these dealers to retain in store for the future at least one-half of the wine crop of each year, so that they may eventually have, what should be the ambition of every wine merchant, as large a quantity as possible of ripe or mature wines.

The vindemiation of Messrs. Sainsevain Brothers, this year, (1858,) occupied six weeks and employed forty-two men, preparatory to the delivery of the wine into cellars from the press. Three men are constantly employed in the cellars, in one of which there are now 350 pipes of white wine, each pipe containing from 130 to 140 gallons. The whole quantity of wine and brandy made by this house, alone, the past season, was 94,000 gallons of white, 4,000 gallons of red wine, 9,000 gallons of angelico, and 8,000 gallons of brandy, amounting in all to 115,000 gallons.

Messrs. Kohler, Fröhling & Bauck manufactured, this season, a total of 100,796 gallons. Mr. M. Keller, in the same county, also made 55,000 gallons of wine.

The total wine-crop of Los Angeles county, for 1858, can be safely estimated at 500,000 gallons. There were also shipped over 10,000 boxes of grapes, of 50 pounds each, to the northern districts of the State, as certified to by the Collector of the port of San Pedro, the outlet of Los Angeles county.

A German company, of large capital, is establishing an immense vineyard upon the Santa Ana River, twenty-five miles east of the city of Los Angeles. During 1857 they planted half a million vines, all now growing and thriving well, and will bear within three years. This company has 1,200 acres inclosed in one field, surrounded with a live fence of Osage orange; and it is intended that their vineyard, when completed, shall contain a million vines. Hundreds of others, farmers and ranch owners, are preparing to set out vines all over our State; and even in the valleys, among the mountains of our mining districts, the vine thrives and grows astonishingly well. Nor are the rich valleys of San José, Petaluma, Sonoma, Napa, Suisun, and Russian River behind any portion of our State in agricultural productions and capacity for fruit-growing. Among the prominent vineyards and orchards in this section of the State is that of Colonel A. Haraszth, in Sonoma valley. The vineyard contains two thousand grape vines planted in 1824, and one hundred and eighty thousand planted in 1857, comprising two hundred and eighty varieties of the grape, which is

probably the largest collection in the State. Colonel Haraszth also manufactures Tokay wine. All the above-mentioned valleys, and foot hills adjacent, are rapidly being dotted with orchards and vineyards.

Intelligent and well-informed Frenchmen, Germans, Italians, and Spaniards all unite in saying that there is no country of the Mediterranean, or of the interior of Europe, better adapted to the cultivation of the vine and manufacture of wine and brandy than California; that it has equally as good a climate, and naturally a better soil. Here grow the strawberry, the pomegranate, the olive, and the fig, side by side with the apple, the pear, and the peach; the grape of Malaga with the hardy Isabella, the Black Hamburg, and the Catawba; the almond, the lemon, and the orange, with the black walnut and the shellbark; the natives of the far North and the far South grow side by side, and flourish well.

At the Mission of San Fernando, twenty-two miles north of Los Angeles, can be seen two gardens, inclosed with high adobe walls, embracing 54 acres, containing forty thousand grape vines, one hundred pomegranate trees, three hundred peach trees, ten apricot, ninety orange, five cherry, and twenty-two fig trees; but the place is chiefly remarkable for its beautiful grove of four hundred large olive trees in full bearing. In addition to the vine, it is also estimated that there are now ready to bear, in California, eight hundred thousand apple trees, nearly two million peach trees, and one hundred thousand pear trees.

THE GRAPES AND WINE OF LOS ANGELES.

BY MATTHEW KELLER, OF LOS ANGELES, CALIFORNIA.

The county of Los Angeles has one million five hundred and ten thousand bearing vines, and eight hundred and seventy-five thousand which were not productive last year, while preparations are being made to plant a million cuttings this season. Our climate and soil appear to be congenial to this growth.

For several years we have shipped to San Francisco large amounts of grapes, but since the vineyards of the northern part of the State have begun to bear, the trade has diminished, although ours are superior. The advantage, however, of the northern fruit is, that it can be brought fresh to market every morning. Consequently, we must more generally convert our grapes into wine. According to the books of the great forwarding house of P. Banning, at San Pedro, the amount shipped to San Francisco, in 1857, was 21,000 boxes, averaging 45 pounds each, and 250,000 gallons of wine; in 1858, 19,000 boxes, averaging 42 pounds each, and 325,000 gallons; the wine having been manufactured in the years mentioned, and principally by three houses, as many of the owners of vineyards have neither the means nor knowledge requisite for this purpose. Of the quantity indicated,

Sainsevaine Brothers made	120,000	gallons.
Kohler & Frohling	80,000	"
Mr. Keller	50,000	"
Scattering	75,000	"
Total	325,000	"

Although this amount may seem large, yet not more than half our grapes are thus manufactured. The natives dry and lose much of the fruit, for want of proper fences; a considerable portion is shipped in various directions, and the Indian consumption is extensive. A vineyard, well grown and kept, will yield an average of a gallon of strong wine to the vine, and some vineyards average 2 gallons. I have a vineyard fifty-five years old, which, although badly managed in former times, averages 2½ gallons to a vine.

It is stated that the grape in cultivation is a variety introduced by the early Mission priests from San Carlos, in Catalonia, Spain, and first propagated from seed, which evidently had the effect of changing its quality, as well as adapting it to the climate and soil—yet other accounts assign it a different origin. Since then the invariable mode of propagation has been by cuttings, under the rudest and most careless culture, consisting of merely scratching over the surface with a wooden plough, sometimes laying off the ground in squares, with a distance of 2 varas (Spanish yards) between the vines, each way, or planting without line or row, by making a hole 2½ feet deep, with a crow-bar. Yet, under such treatment, the memory of the oldest inhabitant does not recall a season in which the grape crop of Los Angeles was not abundant. No manure has ever been used, nor should any of a vegetable character be employed, when the object is to make good wine, except leaves and other parts of the vine itself, cut, dried, and returned to the soil.

Although Americans are now planting vineyards extensively, they follow the old system, only ploughing, and laying off better, not choosing to make innovations upon a mode that has been and is so successful. Doubtless, the manner of planting from nurseries, as practised by the most intelligent vine-culturists of Europe, would be more economical and certain, where the vines remain two years in the nursery, and are transplanted in the third. The advantages would be, first, the use of the ground intended for the vineyard; secondly, the plants could be selected, so as to be all vigorous, and admitting of no failures, as in the case of cuttings; thirdly, in transplanting them, they could be set erect, thus rendering staking unnecessary—an item of great saving; fourth, the holes being larger, the roots would be better accommodated, and the loose soil, also, would constitute a great improvement on the crow-bar system; fifth, saving of labor in cultivating an extensive area of ground for two years; sixth, young vines would not be allowed to bear in the third year, as desired by the old mode, but, being transplanted at that period, would form a new series of

roots, become more vigorous, and produce a larger crop in the fourth year. Bearing a crop the third year certainly debilitates them.

Los Angeles is situated in latitude 34° north, which is within the favored region natural to the vine, and accounts for the abundance and certainty of our crops, while the little labor we expend in its culture insures our profit. Had it been otherwise, with the high rate of California wages, failure would be inevitable. Planting a new vineyard, with us, costs about $10 or $12 an acre. Similar work in Ohio, with the terracing and trellising necessary there, costs from $400 to $500. Our vines are placed 6 feet apart, each way, in squares, leaving lanes and margins. This gives 1,100 to the acre, which, trimmed low and cultivated with a plough, would produce, when well grown, 1,100 gallons of wine. In Ohio, 2,420 vines to an acre produce on an average of from eight to ten years, 250 gallons. The best vineyards of Bordeaux furnish 126 gallons to an acre of nearly 3,000 vines. Thus it is evident that this section is adapted to the vine and to the manufacture of genuine wine, without factitious aids. We need capital to develop our capabilities. As yet, there has been no fair test of our wines, as we are in the beginning, and cannot afford to wait until they have age. We expose them for sale, regardless of reputation, a few months after they are made, and are satisfied that they find purchasers. But we are convinced that if California wines had the same age as many of foreign production, which command exorbitant prices, ours would far surpass them. The sparkling wine made by Sainsevain Brothers, of this place, has been well received everywhere, although comparatively new.

The wild grape abounds in all parts of this county, and there appear to be three varieties—one a rambling kind, producing little or no fruit; another less rambling, but still raising itself from the ground some distance, and furnishing heavy crops of well shaped bunches, fruit large and thin-skinned, and juice saccharine with well developed vinous flavor; and a third, which climbs to the top of the tallest trees, bearing light bunches of small fruits. Old Californians assure me that they formerly made excellent wine from this second variety, resembling in flavor, color, and aroma, the clarets of Bordeaux. It is replete with coloring matter, and I have no doubt that, if properly tested, it will prove an invaluable acquisition to the State. Our cultivated grape has not equally good qualities for making wines of the red as of the white class; it is deficient in color.

It is also said that this variety of the wild grape produced better aguadiente (brandy) than the cultivated fruit, which, in Lower California, among the ruins of the Missions, is white and red, of the Malaga type, introduced by the Jesuits by way of Peru, and is of superior quality both for wine and for the table. The greater part, however, is converted into raisins.

Various foreign grapes have been tried here, but none succeed so well as that now in cultivation. The famous Catawba and Isabella have been experimented with for several years, and at last thrown into the road as useless. If we ever obtain a better variety, it must

be from seeds. The great vineyards which were attached to the Missions of California, with few exceptions, are ruined and dead. That of San Gabriel, in this county, had two hundred thousand vines, of which remain but black stumps to mark the ruin. Let us have a railroad, and we will supply the Union with grapes and wine.

Most of our vineyard labor is done by the Indians, some of whom are the best pruners we have—an art they learned from the Mission Fathers.

MANUFACTURE OF WINE.

The manufacture of wine, in a suitable climate, is simple, and may be done by any one of ordinary intelligence. But when the climate and soil are not adapted to the nature of the grape, then, indeed, it becomes a complicated art. One of the most essential things to be observed in its manufacture, is the proper regulation of temperature, particularly during the phenomenon of the first fermentation; and to this the least attention is paid. If the must is too cool, the fermentation is slow and apt to sour, while, if there is too much heat, it will soon go into the acetous state. Must, which abounds in saccharine matter, and is deficient in ferment, requires a higher degree of temperature than that which has these substances in opposite proportions. The strongest must, even when it contains much ferment, can support a higher temperature than the weak, because the great quantity of alcohol, which is developed, retards the action of the ferment, and prevents the tendency to pass to the acetous fermentation. The best general temperature is between 62° and 64° F. There is little difficulty in maintaining this temperature in a cellar, but it may be observed that the act of fermentation elevates the temperature. To arrive at that which is the most convenient, it is necessary to pay attention to the temperature of the grapes at the time of mashing them. If picked early in the morning, or at noon, it varies many degrees. To obviate this, they may be picked a day in advance, or they should be cooled in a large vat, and *vice versâ*. The temperature of substances cast to the surface during fermentation is more elevated than the liquid which supports them, and if their contact with the air is prolonged, they experience alterations of another nature.

These few facts comprehend all that is necessary to make wine, but they are subject to many variations and much detail, like most other processes of manufacture.

The manner of making wine, in this county, is as follows: The grapes are deprived of their stems by hand; they are then mashed between wooden or iron rollers; some tread them out in the ancient style. A portion of the juice runs into a cooling vat, without pressing; the crushed grapes are put into a screw-press and forced out rapidly, all the result being must for white wine. As the grapes are black, and the coloring matter exists only in the skin, and requires in some degree the presence of alcohol to dissolve it, if the pressing be done quickly, the wine will be white; but if slowly, or if the grapes come broken

from the vineyard, the must will show color; for, as soon as the fruit is broken, and the juice comes in contact with the air, fermentation commences, and simultaneous with it, the presence of alcohol, in a greater or less degree, which extracts the coloring matter. The must is then transferred into the fermenting tuns, and the first active fermentation goes on, according to circumstances, for from four to ten days. The mashed grapes are put into vats to ferment, from which results red wine. This is, in part, distilled into brandy. Some persons distil red wine with the "marc" into brandy immediately after fermentation, but if left to pass a secondary fermentation, it would yield more alcohol.

The wine is racked off in January and February, again in March and April, and for the third time in September. It should be taken off the lees after the first fermentation subsides, when the wine has settled; for it cannot gain anything by being allowed to stand on the lees longer than is absolutely necessary.

The proportions of saccharine matter and ferment in our grapes are well balanced; therefore there is no extraordinary art in making wine; as it will make itself, with common care and without the addition of any extraneous substance. The purest and finest wines in the world are made from the juice of the grape alone.

More capital is needed to make proper cellars, procure necessary materials, and to enable us to hold our wines till they have age, when they would compare favorably with the best. Another great want is a bottle manufactory, that we may store our wines, and prevent counterfeiting, which is now going on extensively.

A poor woman in the adjoining county of Santa Barbara has but one vine. It bore last year five thousand bunches of beautiful grapes weighing over a pound each, yielding her the handsome sum of $400. When a girl, and leaving Monterey to remove to her present home, she picked up a vine cutting to drive her mule. This cutting she planted upon her arrival, and, after the lapse of seventy years, such is the result.

CULTURE AND MANAGEMENT OF THE ZANTE CURRANT GRAPE.

BY S. B. PARSONS, OF FLUSHING, NEW YORK.

Zante, one of the Ionian islands, consists of the city of the same name, several smaller towns, or settlements, a range of mountains, and two valleys. It is twenty-one miles long, and eighteen wide, three-fifths being mountains. The valley near the city is the largest, having a circumference of fifteen miles, the whole extent of which can be overlooked from almost any point on the hill-sides. A more beautiful picture is seldom presented, every foot of land being under the highest culture

with plants of the Corinth grape, which produce the "Zante currant" of commerce. The plantations are numerous and straight, and well kept mule paths, about 5 feet wide, intersect each estate at distances convenient for carrying fruit to the drying grounds. The soil in the valleys seems to be a rich alluvial, inclining to clay, and is from 3 to 10 feet deep. The mountains are calcareous rock, mixed with gypsum, and on their sides, olives are thickly planted. The wash from the mountains, for centuries, with its highly fertilizing materials, has doubtless produced the present deposits in the valleys, and given Zante a soil far superior to that of the other islands.

CULTURE.

The land is owned principally by the wealthier classes, and cultivated on shares by the more intelligent part of the peasantry, who, employing laborers, superintend the culture of this "Zante" and other grapes, the vintage, and the drying of the fruit, &c. There are two classes of these contractors—the *Colonia perpetua* and the *Colonia simplece.* The former purchases of the proprietor and owns one-fourth of the land, incurs all the expense of planting and cultivation, and half that of gathering and drying, receiving half the produce. The *Colonia simplece* does not own any of the land, but incurs all the expense of planting and culture, two-thirds and sometimes four-fifths that of gathering and drying, and receives half the produce. This arrangement, in either case, constitutes the contractor a co-proprietor of the plantation, which annually increases in value until the vines are a hundred years old, the knowledge of the inhabitants not extending further, while they think there is no limit by age to the productiveness of the plant, if properly cared for.

The principal implement of culture is similar to the heavy cotton hoe of our Southern States. Ploughs are never used. The land is prepared for a new plantation by digging it to a depth of 2 or 2½ feet, and turning up dykes around squares, each side of which will measure from 100 to 200 feet. On one side of each square is placed a wooden sluice-way, to be used in irrigation; for, contrary to all our experience in vine-culture, they keep the plants under water two months of the winter. The ground being thus prepared, in January, is allowed to remain until March, and sometimes April, when it is planted with cuttings, though never with rooted vines, which will lose in transplanting the power of "pushing," a property belonging to a maiden plant. The cuttings are from 3 to 4 feet long, and having been buried in the earth several months are the better prepared to take root. The planter makes a hole in the ground a foot wide and 18 inches deep, perpendicular on one side, and slanting about 45° on the other. He then places the base of the cutting against the bottom of the perpendicular side, and laying the rest of it upon the slanting surface, with 2 feet or less above the ground, presses the earth so firmly upon it that considerable force is necessary to pull one up. The distance apart is about 4 feet, or 2,700 vines to an acre.

A plantation being thus formed, the vines make a strong growth the first year, and are ready for the usual culture, which may be said to commence in November, immediately after the fall of the leaf. First, the rain from the mountains is allowed to fill the squares, and the sluices being closed, it is suffered to remain upon the plant for two months. Some years, the quantity of rain is not sufficient to flood the whole valley, in which case there is constant strife and jealousy among the *Colonoi* lest one should get more than another. To this irrigation, they attach the highest importance, and if their experience is a fair test, it conflicts with all our theories of vine-culture. The Zante currant is a veritable vine, and we have been always accustomed to consider thorough drainage requisite in obtaining a crop of grapes. Yet here it will not succeed upon the hills, but flourishes in low land retentive of moisture, incapable of thorough drainage, and flooded one-sixth of the year. Wine grapes, they say, prosper on the hill-sides, yet the finest wines of Cephalonia are made from vines grown in the very beds of the spring water-courses, and flooded every year. They value highly the sediment deposited on their grounds by the standing water, but the importance of the water itself seems proved by the fact that a crop of currants cannot be produced upon the dry hill-sides, however rich the soil. Though irreconcilable with our theory and practice, it is impossible to doubt the correctness of the result which the *Colonoi* have reached by actual experiment. After the water is let off, in December, and as soon as the ground is dry, they commence pruning, and generally finish by the last of January. The mode of performing this operation varies with the age of the vine. With very young plants, each shoot is cut down to two or three eyes; but with those in full bearing, from one to four shoots, according to age and strength, are left from 1½ or 2 feet long, and the remainder cut down to from one to two eyes. If any plant should be rendered worthless by blight or disease, it is removed, and a new one formed by layering in the same place a long shoot from a neighboring vine. Bringing one-third the circumference of the stem near the ground, after the fruit is set, I am informed, is becoming general, particularly in the Morea. It is thought to double the productiveness, but injure the quality. This, among other causes, may be the reason that the Zante fruit is sweeter and richer than that of the Morea, this practice being less prevalent on this island.

The pruning being finished, they commence drawing the soil away from the roots of the plants to a depth of 6 or 8 inches, and piling it up in conical heap, some 18 inches high in the middle of the intermediate space, where it is allowed to remain until after the vine has put forth its spring growth. This mode of cultivation is also employed with the wine grapes, and could doubtless be imitated advantageously in the culture of other plants with us. The soil, in this way, is made thoroughly accessible to atmospheric influences, and can absorb the nutritious gases, while the plant in a dormant state receives for its roots a more abundant share of the sun's rays and the winter rains. Another object is also gained: the destruction of all roots within 6 inches of the surface—an essential point with good grape-

growers in Europe. In the northern climate of our country, this custom would be manifestly improper in winter; still, it could doubtless be applied in spring, not only to vines but trees. By exposing the roots the middle of March, and covering them again from the middle of May to the first of June, much fertilizing material would be absorbed from the atmosphere; and the sun, having more speedy access, would start the sap much earlier, and thus give the plant a longer season for its growth. With grapes, it might produce a very important result—the earlier ripening of the fruit. In the climate of New York, a week or two gained in the maturity of grapes would be a valuable acquisition, as, for want of this, some of our finest hardy varieties are lost, except upon the Hudson.

After the earth has been thus drawn away, the careful cultivator places from a peck to a half bushel of stable or goat manure around each plant, to be washed in by the winter rains. This costs about 2 cents a bushel. The outside lines of each square are trained to low trellises made of bamboo, thus protecting the others while they form a definite path for the mules. The plantation is then left without further attention till May. Towards the last of March or the beginning of April, the plants commence growing, and when the young shoots are a foot long, before the fruit is set, the soil is restored to the roots. This is equivalent to a second thorough cultivation. During summer, care is taken to keep down the weeds, and when the fruit becomes sufficiently large to bend the branches, they are supported by cane trellises or forked stakes.

About the middle of August the vintage commences, and continues until the last of September.

DRYING AND PACKING THE FRUIT.

The grapes, designed for currants, being pulled after the dew is off, are taken in panniers on mules to the drying grounds, which are squares of earth, each containing about 1,600 feet, gently sloping from the centre to the sides, and cleaned from grass and weeds. Here the bunches are placed one cluster thick and left from ten to fourteen days, in a temperature of 65° to 70° F. Each square will cure about 1,000 pounds of dried fruit at a time, and there are rarely more than two curings in a season. The first is considered the best, because the currant grape, when perfectly ripe, is better than when over-ripe, and also the sun is then stronger. A shower of rain is much dreaded at this period, as it often destroys half the crop, while a second shower sometimes ruins the rest. The value of coverings, similar to those with which we protect our hay, is not understood here, though they could readily be thrown over the drying grounds.

After the fruit is thoroughly dried, brooms are passed over it, the stems separated and carried away, the currants swept into heaps, and then carried to the city and stored in bulk in magazines called *seraglie*, where they are packed and made ready for exportation. As the drying is upon bare soil, the sweeping collects with the currants a quantity of dust, which, adhering to them, is so much the aversion

of all good housekeepers with us. To the merchants of this island, who complained of the small consumption of this fruit in America, as compared with England, I gave as a reason, that good servants being more rare in our country, ladies were accustomed to attend personally to the nicer articles of food, and would avoid anything requiring so much trouble as to clean their currants. By way of remedy, I suggested the use of flagged or cemented drying-grounds. They replied that the present mode radiated the heat and absorbed the moisture better than the plans proposed, and therefore the latter would not be worth the additional expense. They seemed scarcely aware of the contradiction, when showing me some excellent samples dried in trays for their own family use. I heard of fine currants produced in Cephalonia by drying on a hard surface made by mixing cow ordure with the soil, though this, I believe, is not common. In the magazines, the fruit is packed for exportation, in barrels of 200 pounds, or butts of 2,000 pounds, no machinery being used for this purpose, but the stamping power of human feet. Juice from the grape is extracted in the same primitive manner.

INSECTS AND DISEASES.

The currant vine is subject to the attack of a slug, which appears just after the first pushing, and injures the young shoots. It is similar to our rose-slug. For three or four years, the finest vines were destroyed by a sort of beetle, about the size of a horse-fly, supposed by some to have been brought by the sirocco; by others to have been generated in the soil. Clayey grounds escaped entirely. It came out in the night, and punctured the vine immediately after the formation of the fruit. In the spring, a hoar frost is often destructive to the young shoots. There is also a black fly which is injurious; while rain and sea-fog will sometimes cause great damage, particularly when the fruit is beginning to ripen. But the most dreaded enemy has been the *oidium*, or mildew, the well-known blight of so many vineyards in other parts of Europe. The use of flour of sulphur has been found an effectual remedy for this disease, and its application is now a part of the culture. Long tin tubes, 2 inches in diameter, and perforated at one end like a pepper-box, are employed for this purpose.

CLIMATE.

It is difficult to understand the nature of the climatic influences which affect the currant grape. Its successful culture is confined to a narrow belt, some sixty miles in width, and east of a line touching the westernmost point of Cephalonia. It will not grow in Corfu even for table use; its success is only partial in Santa Maura, while its finest growth and fruiting may be seen in Zante, Cephalonia, and the southern coast of the Gulf of Corinth. It is inferior on the northern side of the gulf and at Lipari, while in Sicily, the same latitude with Zante, its culture fails. The hygrometric condition of Sicily is similar

to that of Zante, and the latter is equally subject to the chilling and scorching effects of the *maestre* and *sirocco*. Both in the culture and climate which it demands, the currant grape is eccentric, and no philosophical reason can be given for its peculiarity.

The following table of observations, by Fahrenheit's thermometer, made at Zante, in 1857, will give the best understanding of its climate:

	January.	February.	March.	April.	May.	June.	July	August.	September	October.	November.	December.
	°	°	°	°	°	°	°	°	°	°	°	°
Minimum	49	43	49	57	61	62	72	66	63	63	50	41
Maximum	61	57	68	72	78	82	89	86	78	77	66	60
Rainy days	27	11	8	6	6	13	0	7	11	13	9	2

The winter climate is variable and wet—the summer oppressive. Water rarely freezes, although a biting wind often comes from the snow-covered Arcadians.

STATISTICS.

The price of labor varies, according to the season, from 25 to 60 cents a day. The higher price is owing to the demand in the Morea, at certain seasons, for the labor of the Zantiots, who are esteemed the most skilful and industrious of all the islanders.

The best currant land is worth $200 per acre, and when planted, is valued at $700. The yield varies from 1,500 to 3,000 pounds of dried fruit, per acre, and in some rare cases 5,000 pounds have been produced. Vines will bear moderately the fifth year, and a full crop in from ten to fifteen years after being set out. Single plants often produce 5 pounds, and some as many as 25 pounds of dried fruit each. Although the Zantiots have overcome their serious enemy, the *oidium*, which at one time almost reduced them to starvation, they feel greatly discouraged with the prospects of their special culture.

During the war of independence in Greece, the currant grounds, on the mainland, were nearly destroyed, and Zante, with Cephalonia, had almost a monopoly of that produce. In the Morea, the currant vines have been replanted, and are rapidly increasing along the Gulf from Patras to Corinth. The soil on the Gulf is richer, and the crops will be more abundant, but the fruit is not so sweet as that of Zante. This last quality, however, is not appreciated by purchasers generally, and therefore Patras attracts the principal trade, its roadsteads being crowded, in August and September, with English vessels taking in cargoes of the dried fruit, Britain being much the largest consumer.

The crop, for 1858, in the Morea and islands, is estimated at 36,000 tons, gross, from which there has been shipped—

	Tons.
To Britain	24,000
To Germany and Holland	4,500
To Austria	1,100
To the United States	900
	30,500

Leaving on hand, 5,500 tons unsold, for which there is no present demand. Improved modes of culture, with an increased quantity of land, will, it is believed, bring next year's crop up to 46,000 tons. The stock on hand, in England, at the commencement of 1859, was more than double that of last year. Unless the consumption, therefore, should increase, the supply will be far greater than the demand. In years past, the price in Zante has been as high as $120 per 1,000 pounds; it is now $35, and but few sales. The cost of cultivation and drying is estimated at from $10 to $12 per 1,000 pounds. At 1,500 pounds to the acre, the produce at present prices would be $52 50. Deduct the cost of production, and $42 will remain, or 6 per cent. on the investment of $700 per acre, leaving nothing for the accidents attending all fruit-culture.

CULTURE AND PROBABLE PROFITS IN THE UNITED STATES.

It must be that, in our widely extended country, with its varied soil and climate, some locality will be found adapted to the culture of the currant grape. I doubt its success, however, at any point north of the latitude of Charleston, South Carolina, or east of the Mississippi. Still, it should be generally tested. In Florida, along the St. John's River, or in the rich soil of the Alachua district, is the most inviting prospect east of the Rocky Mountains. Successful in any locality, whether Florida, Texas, or California, its culture with us would doubtless fully compensate for the difference in the cost of labor, and our profits would arise from the higher price of fruit in this country, caused by the export duty of 20 per cent. in the islands.

The price of this fruit in New York is now from 6¼ to 7 cents per pound.

2,000 pounds per acre, at 7 cents, would be $140.

Interest of 7 per cent. on cost and preparation of land	$49
Cost of cultivation	20
Packing and commissions	6
	75

Leaving a profit of $65 per acre.

This is probably a low calculation for the production, under the care of intelligent men, but a larger estimate of profits would not be

safe unless prices advance. If the fruit could be brought to any of our large markets in its fresh state, it would doubtless command a ready sale at 20 cents per pound, by the quantity. Four thousand pounds, in this condition, would be a less crop than 2,000 pounds dried, which, 4,000 pounds at 20 cents would amount to $800.

Cost of cultivation	$20
Interest, as above	49
Incidental expenses	6
	75

Leaving a profit of $725 per acre.

If properly dried and carefully put up, this fruit would be eagerly sought, not only in the regions where it would grow, but would find a ready sale at high prices in all the Middle and Northern States, thus avoiding the objections urged against that of foreign production.

CULTIVATION OF GRAPES IN NEW ENGLAND.

BY R. H. PHELPS, OF WINDSOR, CONNECTICUT.

More interest is manifested at the present time, in New England, as to the production of the grape than, probably, in any other kind of fruit. Associations have been and are being formed for the purpose of acquiring the knowledge of soil, location, and culture most suitable for this object, and for discussing and deciding upon the merits of the many varieties now being brought into notice, with the important uses to which they are adapted.

Until within a recent period, it would seem, the fact has scarcely been realized that, in this country, unlike Europe, the vine is indigenous—that it was found in profusion by the Northmen in their discoveries on this Continent more than eight hundred years ago, inducing them to name the country "Vin-land dat gode," (the good wine-land,) while the vine has continued spontaneously to hang her noble festoons of drapery upon our hedges and forests, inviting the kindly aid of man to cultivate and improve. Our native varieties, called "Fox grapes," characterized by their hard pulp, thick skins, and pungent aromatic flavor, are found in every kind of soil and situation. We see them by the side of brooks and rivers—in sour peat marshes, creeping over hedges and brambles—on our sandy plains, or mountain forests, climbing often to the height of 50 or 60 feet, and ripening their fruit in every location.

The grape interest with us is now rapidly encroaching upon that old standard fruit, the apple, which appears to be beset by a multitude of destructive insects, rendering it, frequently imperfect, and admonishing us that, like other productions of earth, it may now be entering upon its period of decline; while the vine is comparatively free from the depredations of insect tribes, and generally yields her fruit in constant and abundant perfection.

No foreign variety tested here has succeeded in open culture; and even under glass protection, they are now being surpassed, in the estimation of many, by some of our native seedlings which have recently appeared. The varieties chiefly approved by us have been obtained either from the Middle, Southern, or Southwestern States, or produced from the seeds of those thus obtained; and we are fast approaching the desirable result of our efforts, by establishing vines possessed of all those esteemed qualities of hardiness, early maturity, fruitfulness, melting pulp, and fragrant aroma. For the successful cultivation of our new varieties, reasoning from what we know, we must bid adieu to the old prototypes, and encourage the new, by giving more particular attention to soil and location.

As a general rule, we prefer a porous soil, moist in a degree, but not retentive of moisture—warm, friable loam, which can be readily pulverized, and is not liable to become hard-baked by the sun. A soil abounding in disintegrated rocks, reddish gravel, or brown peroxyde of iron, appears to be especially adapted to grapes. Nearly all of our American varieties will thrive upon land on which a good crop of Indian corn can be raised, and upon the mountains and stony hill-sides, where grain or grass would make but stinted growth. They will feed and produce where other vegetation would starve. This is believed to be true all over the world. In some parts of Europe, the vine is grown upon ledges so steep that the laborers can only with difficulty stand at their work, and on such situations excellent wine is produced.

With us, a subsoil porous and permeable is absolutely requisite, that the roots may penetrate, which they will do to a great depth if no obstruction prevent. A stiff, retentive substratum can be ameliorated by deep and thorough drainage with tiles, so that air can be admitted and the surplus water pass off. It is well, under any condition, to break the earth at least to the depth of 18 inches in any ground where the grape is planted. It is not claimed that poor sterile land is to be preferred, but a proportion of sand, gravel, and stones underlying deeply the surface soil, is generally suitable for this product.

Between soil and location, I consider the former of the most importance. If a vine has sufficient depth in any good earth, it will ordinarily thrive in almost any locality. There is, however, something to choose in situation as regards exposure, and a southern or southeastern declivity is usually recommended. A hill-top or gently undulating surface is better than a level, or even than a deep valley. Upon hill summits or elevated ground, the temperature is more mild and uniform than in the valleys beneath, consequently such locations are better adapted to the grape, as well as to the apple, peach, and other fruit.

Dr. Kirtland, of Ohio, has applied the test of science to this subject though the result only relates a fact heretofore well known. He stationed himself on a hill, with a thermometer, lantern, and watch, on a night when a severe frost was expected, while his brother, similarly provided, stood in the valley below. Each made and recorded

observations every half hour during the night, and the result was as follows: From sunset until 9 o'clock, both thermometers indicated the same degree of temperature; at 9 o'clock, the mercury in the valley thermometer commenced sinking, while that on the hill began to rise, and a warm current of air was perceptible flowing upward from the valley. At 12 o'clock, the thermometer in the valley indicated 12° lower temperature than on the hill, and about the same difference was observed until daylight. The rays of the sun also concentrate in a valley, and cause extreme heat in the day, while on elevated ground they are more diffused, and the heat is less intense and more uniform. Hills, in the neighborhood of lakes, ponds, and rivers, where the leaves can readily imbibe moisture, are friendly to the vine in America, where we have periods of excessive drought.

PROPAGATION AND PLANTING.

Grapes may be propagated by seeds, by layers, by cuttings, or by engrafting. If it is desired to produce from seed, they should be taken from those clusters which are the earliest, largest, and most fully ripened, and from those fruits containing the least number of seeds. They are much improved by remaining in the pulp for a length of time after maturity and before decay commences. By a careful selection of well-ripened seeds, all kinds of fruit can be improved. There is occasionally, however, in the vine some uncertainty about its fruiting when cultivated from the seed, owing to the fact that it may be deficient either in stamens or pistils. Native vines, growing wild in the forest, are sometimes barren, but can readily be brought into bearing by engrafting from others which are prolific.

As soon as the seeds are taken from the pulp, they should be sown in a mellow soil, in the open ground, slightly covered with light earth, and vine leaves, or other litter, spread upon the surface before winter sets in. The warm weather of spring will cause them to germinate, when the young shoots will soon reveal their true character.

In producing from seed, there is, in many kinds of fruit, a tendency to degenerate into the wild parent state, and of dozens of grape seeds, perhaps not more than one really valuable kind can be relied upon as an improvement worthy of being cultivated. Errors are often made in the selection of the young plants, by choosing those which show a large growth, having long-jointed stems and large leaves. Such plants should be rejected; for, in most cases, they will prove to be diœcious, by the abortion of the male or female organs in the blossoms. The better kinds are recognized by their smaller growth and shorter joints. The seeds, if desired, can be started in pots of fine earth, frequently moistened, and any lady may unite profit with pleasure by tending them in a conservatory or warm, light cellar. After they are well started, the potted earth and roots may be emptied and planted in the ground where they are destined to grow; but it will be advisable, during the first year, to shade the ground about them with litter, in order to preserve a more uniform degree of heat and moisture through the dry summer months. In the fourth year these seedlings will gener-

ally commence bearing, and after they have fruited two or three summers, their qualities can be definitely determined.

Propagating by layers is the quickest method of raising grapes, where separate roots cannot be obtained, and besides, as by cuttings, we are certain of identically the same variety as that from which we propagated; consequently, it has this advantage over seeds, when the purpose is not to change the quality of the fruit.

Bend down a shoot in the spring from the parent vine of the previous year's growth, and cover one or two of its joints with an inch or two of earth, or inverted turf, and keep it in its place by pinning it across with sticks into the ground; or lay a stone upon it, leaving two or three buds on the end above the surface, and if the earth is moist and warm, it will readily strike root, and may be cut from the old vine the succeeding winter. If left uncut, it will bear fruit the next summer.

Large healthy roots will occasionally fruit the first year they are planted, if managed with care, but this generally occurs the second season. Few grapes are allowed to mature, at first, otherwise the future vigor of the vine would be injured. Roots may be planted in the fall, after the leaves have dropped, and before the earth freezes; but from experience, early spring is indicated as the better time. Fresh stable manure should never be placed directly in contact with the roots, nor, indeed, any substance tending to ferment, or to form an acid or salt of a highly stimulating nature. Very deep planting is favored by some, but if there is sufficient permeable depth in the earth, the roots will readily find it, and they need, therefore, to be inserted only to the depth in which Nature designed them to grow.

In a well-established productive vineyard of between 20 and 30 acres, a few miles from the city of New York, the vines stand about 6 feet apart in the rows, and the rows 6 to 8 feet distant from each other, with an occasional wider space for a cart path. The vines are supported by posts 10 or 12 feet apart in the rows, and are about 6 feet above the ground. Three strands of wire are extended upon the posts. The lower wire is about a foot from the ground, and each wire and post receives a coating of coal tar, which serves a cheap and excellent purpose in preserving the iron and wood from rust and decay. When the rows are 6 feet apart, a space of 10 or 12, or even 15 feet, can well be occupied, as the vines increase in size.

CUTTINGS.

Take wood of the previous year's growth, well ripened, and cut into lengths of two or more joints. A short piece of the old vine attached makes the cuttings more sure to start. They can be taken from the fall or winter pruning, and buried in sand or moss in a cellar, or placed in open ground, and covered with a few inches of light earth, where they may safely remain until required in the spring. When set out, they are cut off near the lower bud, which must be left on the cutting, and an inch or two above the upper one.

A plan has been adopted which, with some varieties of the grape,

has proved successful, namely, propagating from single buds, with a short piece of the wood attached to each, and buried in sandy earth, or in pots, kept well watered. By this method, it may readily be perceived that multiplication of the plants can be more rapidly effected. Probably no species of vegetation surpasses the vine in the variety of methods which can be practised in the unbounded ratio of its propagation. Its tenacity of life is remarkable. Some prunings, cut off in November, which lay scattered upon my ground, exposed to alternate freezing and thawing, and to the rains, snows, and dry winds of winter, were planted in the spring for experiment. Many of them lived, and made a good growth during the summer. Vine cuttings can also readily be transported a long distance, without material injury. I have received them, by mail, in growing order, from Michigan, with only two buds on each, waxed on both ends, inclosed in a little moss, enveloped in paper, like a public document, and the postage prepaid by weight. They may be set in a slanting position, in mellow earth, a few inches apart, leaving the uppermost bud level with the surface. A large proportion of sand in the soil is particularly recommended, as it preserves a more equable moisture, and checks the tendency to mould and decay. The moisture is to be kept up during the first summer, or they may fail to strike root. Shaded ground, or better still, a mulch of straw, spent tan-bark, or leaves would be beneficial; and a weak solution of guano in water, occasionally sprinkled over them, after July, it is believed, operates well in stimulating their growth. In the second or third season, they may be transplanted into the spot where they are to grow, according to directions previously given in this article.

ENGRAFTING.

The chief advantage of engrafting consists, first, in the power to convert the roots or vine-stocks of an inferior kind, or which are barren, into better varieties; or, second, to bring scions into quicker bearing. It is performed as follows: Cut off the root intended for engrafting an inch or two below the surface of the ground; split the end with a knife, or chisel, and having tapered a scion in the shape of a wedge, insert it into the open cleft; then return the earth around the scion, leaving one bud even with the surface. This operation is usually performed in the spring, when the buds begin to swell, or it can be done later in the season; but, in that case, it is necessary that the scions be retarded, by being kept in a cold place until wanted for use. All sprouts from the root below must be rubbed off, whenever they appear, and caution should be observed not to loosen the scion from its place. Another way is to cut off the root, as above directed, and bore one or more holes into its top, an inch, or 1½ inches deep, of nearly the same size as the scions, and shave them off to the size of the hole, leaving a square shoulder on the bark, to be pressed closely down. Roots of wild vines may be dug up and cut into pieces 8 or 10 inches long, grafted in either of the aforesaid manners, at any leisure time in the winter, and buried in a

cellar until spring, the joined parts covered with bandages, or wax, so as to exclude the air. It is not essential that the bark of the root and that of the scion coincide, which is requisite in other kinds of grafting. The scions, in most cases, will put forth roots of themselves, and will often bear fruit the following season.

MANURING AND CULTURE.

The proper manure for vines depends somewhat upon the nature of the land on which they grow. Where it is clayey, or stiff, fertilizers of a light and warming nature are needed, such as sand composted with lime, ashes, &c.; or, if sandy, a heavier compost, with clay as its base. Special fertilizers, as guano, gypsum, poudrette, ashes, &c., may be used in spring, or early summer, and mixed with the surface soil; but they should be applied before the fruit is maturing.

Like other plants deriving their best nourishment from a return of the chemical constituents, which have been extracted from the soil, contained in their own decaying vegetation, the leaves and prunings of the vine are congenial elements for its growth. Bones, old leather, refuse plaster, turf compost, soap-suds, &c., constitute good manure. Bones appear to be the best of all substances to promote its permanent vigor. In digging up a grape vine, near which some bones had been buried, I was surprised to see with what avidity the roots sought after them; every bone was literally covered with a network of fibrous rootlets, and every cavity so filled with them that it was impossible to disengage the bones without tearing the rootlets to pieces. This vine had been noticed for its luxuriant growth and dark foliage. A handful or two of bonedust, mingled with the soil around a vine, will show its good effects for years. The soap-suds and kitchen waste of a family, which are usually thrown away, would be sufficient to nourish several vines abundantly; and how much would home comfort be promoted were the noxious miasma often generated from such refuse removed from many doors, both in country and city, to be quickly imbibed and elaborated by the generous vine so surely to be transformed into fragrant foliage and beautiful clusters of rich, ripe fruit!

When the leaves of the vine are yellow, an exhausted soil is usually found to be the cause, and well-rotted manure is applied by spading it in between the rows, or by hoeing, forking, or harrowing it under the surface. High manuring induces a large growth of wood, and fine-looking fruit, which is well enough for table use, but the qualities essential for good wine are injured; a slower growth in poorer soil makes a better flavored wine, though in less quantity, thus illustrating a principle in philosophy, that "what is gained in speed is lost in power." A dressing of wood ashes, each year, is a benefit, by supplying the loss of alkalies, which are largely consumed by the grape, destroying acidity in the soil, and tending to sweeten this as well as all kinds of fruit.

Whatever element of fertility may be applied, it should never be done when the grapes are approaching their full size, nor early in the

fall; because the result would be a larger growth of canes, which, not being sufficently matured to withstand the winter and spring frosts, would hazard the life of the vine.

Mulching the ground with light manure, muck, or especially with vine leaves, makes an absorbent for the heat during the day, which is in part radiated at night, causing a more equal temperature, and during the hot drought of summer, holds in absorption the rains and dew, thus screening the earth from two extremes, heat and drought, lessening the danger from autumn frosts. and promoting a full development and maturity of the fruit. All vine-growers discard the practice of compressing the ground with their feet while the vines are in a growing state in wet weather, for a hard impervious sod prevents those essential conditions for the grape, uniform circulation of air, moisture, and heat.

PRUNING AND TRAINING.

As to the right time for pruning vines in New England, we have mostly come to the conclusion that early winter is the best. Some prune soon after the falling of the leaves, in the month of November, and the result of various trials confirms the opinion that this is better than any other season for that purpose. No good reason is offered why the roots should be required to support life in all the branches through winter, and then to suffer a large part of them to be summarily shorn off in the spring. The loss of sap from the pruned ends (which we call "bleeding") is generally disastrous with us, if the work is delayed until February or March, as is sometimes recommended. Vines severely pruned in March, in some cases, have been nearly ruined by profuse bleeding, and their fruitfulness destroyed for years. If the partial loss of the sap is detrimental, the analogy holds good in a greater degree, as "the whole is greater than its part."

Respecting the best method of pruning vines, opinion is undergoing a decided change. The practice in Europe of very close pruning has been followed in this country by foreign vine-dressers, without duly considering the difference of climate and the character of our vines. Ours are indigenous, while the vines of Europe were originally brought from Asia, some two thousand years ago, and have become dwarfed by excessive pruning, so that they will bear the loss of nearly all their tops with comparative impunity, and submit to be planted in hills about as thick as our Indian corn. But at last they show the certain effects of long ill usage, in the fatal *oidium*, or blight.

Many dispute the propriety of close pruning American vines; for here, the soil and climate, characterized by extremes of excessive heat and abundant moisture, are adapted by Nature for more vigorous and extended growth. In truth, there would seem to be no other fruit-tree or vegetable which can endure such an annual amount of amputation, defloration, and depletion, and still survive, or continue in any degree of vigorous longevity.

As some small portions of a vine naturally die out of themselves, each winter, would it not be as well to follow the hints of Nature in our practice, and to cut away but little more than ordinarily withers, or would be browsed off by cattle? Is not the fatal rot, which so generally blasts the grape in Europe, and has begun to be fearfully felt in our short-pruned American vineyards, owing in a measure to this practice? Has it been ascertained that the Catawba, which grows wild in the Carolinas, is ever affected by disease? The wild grapes of this latitude have never been known to be diseased, but very likely they could be brought into that condition by a few successive years of severe pruning. One thing is positive, that healthy native vines of the Fox grape, in this vicinity, which have received a scientific pruning, have been almost hopelessly ruined, and remained fruitless for several years. Various modes of pruning have been suggested by those who are entitled to credit for their experience, but no system is adapted to every condition; for something depends on the age of the vine, the variety, and the space allotted to its growth.

As a general rule, that system of pruning is best which shortens or thins out a moderate portion of each season's growth, allowing a gradual and uniform increase, and with a view to check the tendency of the vines to bear fruit exclusively on the extreme ends of the branches. Some varieties of moderate growth are pruned and trained according to what is called the "renewal system," upon stakes in the following manner: In the first year, the vine is cut down to one or two buds, and one or more stakes, 6 or 8 feet long, are driven firmly into the ground. The young shoots as they grow are tied to these, with straw or willow twigs. In the second winter-pruning, these canes are cut down to three or four buds each, and the third winter to five or six. All laterals are pinched off each year as they appear, that the force may be carried into the original canes. In the third season, and sometimes the second, the vines will produce some grapes, and double the first number of canes are trained upon the stakes. In the fourth and succeeding year, cut off the two canes, if two have been allowed, which were grown the previous season; these are to be the bearing wood for the next year. The two others are cut off to seven or eight joints, bent over in the form of a bow, and tied to the stake. But a greater length of vine is preferred by many, and in that case, three or more stakes are set, and the vines conducted around them as they grow. This plan has its advantages; for it allows a free circulation of air among the leaves, which is a great point to be gained, and not the least is the encouragement given for more length to the vines, as they can be carried around nearly horizontally as they rise spirally upward; and if the stakes are set at a good distance from each other, a great length can gradually and easily be obtained.

The famous Catawba wine grape is now generally abandoned, in New England, and its place is better supplied by earlier, more vigorous, and hardier sorts, as the Hartford Prolific, Diana, Isabella, Concord, &c., which thrive with less pruning, occupy more space, and admit a more extended system of training.

The mode of training, which is gaining favor with us, is that upon wires. This method is suited in a remarkable degree, to the vine, as its nature is to ramble far over hedges, trees, and fences, and to clasp its tendrils tenaciously around every twig and shrub within its reach. It will send out its long arms in a direct line towards a pendent limb, or branch, and cling upon it with great avidity. Vines of the Isabella will in one summer make a growth of 20 or more feet upon a tree; and the best grapes I ever raised, were from a vine which had climbed upon the house and twined around nails driven into a chimney 30 feet from the ground. By trellising upon wire, no tieing up of the vines is necessary, which saves much labor; for the tendrils, their natural and best support, eagerly take hold of the strands of wire, and have a chance to indulge their rambling, climbing propensity. Besides, they easily accommodate themselves to the wind, by the vibrating facility of the wires, and a free circulation of air is obtained.

Wires No. 7, 8, or 9, annealed, or covered with a coat of coal tar, will last a long time, and are easily repaired if accidentally broken. The wires should be from 1½ to 2 feet apart, and the number must depend on the height of the posts, which may be 6 or 8 feet above ground and 10 or 12 feet apart, on a line with the vine rows; or they can be set 20 or 30 feet apart, and the place between them supplied by stakes, with oblique notches sawed into them to receive the wire, and nails driven over each notch to hold the wire in its place. They can be fastened to the posts in the same manner, but a better way is to procure iron staples, or make them out of good sized wire, which any one can do, and before the wires are tightened, drive the staples into the posts at their proper distances. Each end post is set firmly into the ground, 4 or 5 feet outside of the end vines, and supported by a brace extending from its top, to a stone or stake driven into the ground a few feet distant.

A simple and effectual way to tighten the wires is as follows: Fasten one end to an end post, and bore holes through the other end post with a brace and auger-bit, according to the number of wires intended to be used; run the wires through the post, and extend them a few inches beyond; prepare some sticks 1½ inches in diameter, and 6 or 8 inches in length, and having bored a small hole through one end, square the other end, so that it will fit into a common wagon-wrench; by turning the wrench, a powerful tension can readily be obtained, after which, drive a nail through the stick into the post, and the work is done. This plan is also adopted in putting up wire fences in this vicinity, and operates well.

Our native vines are so exuberant in their growth, that it is not easy to give precise rules for pruning and training, suitable to all cases. Some advise to limit the growth to two or four main runners, but a vigorous root can well sustain eight or more. The stem may be cut down to one bud when planted, and this trained in two branches, forking each way upon the lower wire, 12 or 14 inches from the ground; from these two branches, eight runners may be trained vertically, or diagonally; of these, according to the renewal system, four

alternate ones are to be shortened at the winter pruning to one bud each, and the intermediate ones to be trained to the wires above. These long canes will bear grapes the same year, throwing out a shoot at every bud, and each shoot producing several clusters. At the next season of pruning, these canes are to be cut down to a single bud, and the other four canes encouraged to grow for bearers the next summer. It is to be remembered that the fruit always grows on young or new shoots, which start from the wood of the year preceding. This principle will serve as a general guide in pruning the vine under all circumstances, and any one, by a little practice, can perform the work.

The custom of summer-pruning, and plucking off the leaves to ripen the fruit, is now less approved than formerly, and is only allowable when the intention is to throw the whole force of the sap into those branches which are to be exclusively encouraged, and trained in some particular direction. It has been said that the vines should not be trimmed at all. No fruit ripens better, nor indeed so well, by having its leaves stripped from the stems. This fact is observable in our apple, pear, and other fruit trees. When worms have consumed the leaves on a limb, its fruit is invariably injured, and is generally worthless. The physiological fact that leaves are the lungs of all vegetable life, is sufficient to shield the grape from the abuse it so often receives.

Wall-trellising is gaining favor wherever practised, and can be done with much economy. A few feet of waste or unoccupied ground about a barn, out-house, shed, or near the walls of a dwelling, afford a most congenial spot for grape-vines, and they are easily trained so as to cover a large area on the side or roof of any building. They are supported by nails or staples driven into the walls, or by wooden slats or wires, running horizontally across from corner to corner, at a few inches from the wall. They may be trained up the side of a lean-to building, and from the lower edge of that roof, they may follow wires leading over the roof, up to the adjoining one. This answers well where the roof is covered with metal or slate, and therefore not liable to decay by being shaded with the foliage; it also serves a useful purpose in shielding roofs of those materials from the hot rays of the sun.

Close pruning from near the root is neither advisable nor, indeed, practicable, where the vines are allowed so great a length and extent of surface. The trimming should be confined principally to the extreme ends of the long canes, and to the spurs which range along the main vines and their laterals, leaving three or four buds on each spur for bearers, the coming season. All dead or decaying wood should be cut out, and in the spring, the loose, shaggy bark should be stripped off, and the trunk washed with soap-suds. This will add to its neat, healthy appearance, and prevent depositories for the eggs of insects.

If the vine stand in a location which induces a tendency to mildew, a good remedy is a wash composed of two parts of lime and one of sulphur, to be made into a thick paint, with boiling water, and

applied with a brush to the stems and main branches early in spring. Flour of sulphur, sprinkled over the leaves, in June or July, answers a similar purpose, and checks a tendency to rot in the grapes.

VARIETIES.

Among the large and increasing number of vines now commended, one may hazard the faith of others in his good judgment by recommending a particular kind, above all the rest. Therefore, with due deference, I may be permitted to mention some which bear the palm of excellence, if not of perfection.

The *Diana*, a seedling from the Catawba, is unquestionably one of the best kinds now cultivated in the Northern States. By a vote of the Grape Growers' Association of Connecticut, a few weeks ago, it stood the first in rank, in their opinion, for open culture. Its flavor is similar to the Catawba, but generally esteemed superior; it is more hardy, and several weeks earlier. As a wine grape, its indications are promising, and when dried, they make raisins of a fair quality.

The *Hartford Prolific* is a grape which has been thoroughly tested, and its merits are now established as being the earliest in ripening, of good flavor, and, as its name indicates, immensely prolific. It is hardy in all the Northern States and Canada, and a vineyard formed of it is being located in Georgia for wine.

The *Isabella* has been generally cultivated here, and its good character is too well known to need extended comments. If, in this latitude, it ripened a little earlier, it would improve in our esteem.

The *Delaware* is a vigorous grower, and its fruit of fine flavor, resembling the Chasselas and other foreign grapes. Its fruits are rather smaller, compact in the clusters, and bear transportation well.

The *Rebecca*, a beautiful light-colored grape, resembles in appearance and quality some of the highly-prized tender sorts, and is hardy in favorable localities.

There are more kinds which have proved good, and others that promise well; but the above list would seem almost sufficient to please and satisfy the most fastidious amateur, and to convince Americans that the United States will eventually take the first rank among the grape-growing nations of the earth.

PROFITS OF VINE-CULTURE.

The net profits of this culture, on an extensive scale, in New England, when estimated by other pursuits, are yet to be determined by further comparative experiments. Thus far, large vineyards have not been planted here, or are in their youth, and the ultimate product remains to be ascertained. Some have recently been planted, comprising two or three thousand vines, but generally they have been limited to the garden, or trellised upon the walls of buildings.

The principal part of our wine has hitherto been obtained from wild grapes, and the production is on the increase. It is estimated that about 100,000 gallons were made in this State the past season, being nearly double the quantity of any year previous. But the Fox grape

is rather acid for wine-making, and we are seeking, with encouraging prospects, better varieties for that purpose.

If we may estimate the yield of Catawba in the Southern and Middle States at 5,000 pounds, which is probably near the average, we are justified in saying that the business can be considered as remunerative with us, should we raise at the rate of 6,000 pounds of Isabellas to the acre, which has been done. The price of these grapes, in our markets, has averaged at least 6 cents a pound, amounting to $360 per acre; more, doubtless, were sold at 8 cents than at a less price. They have been purchased chiefly for table use, as they would thus bring more than by being converted into wine. The amount of money realized from the tobacco crop, for a few years past, in the Valley of the Connecticut, has probably averaged $300 per acre. Now, more than five times the quantity of manure is annually required in raising an acre of tobacco than an acre of vineyard, and the labor necessary for the vineyard is less than that usually bestowed upon the tobacco; yet this is regarded by farmers as the most profitable crop grown in New England.

In the departments of France, about 4,000,000 acres are in vineyards, yielding, in favorable seasons, an estimated income of $140,000,000; while in all the United States, 3,500 acres comprise the probable maximum of land at present allotted to that purpose; and notwithstanding we obtain about double the weight of grapes to the acre, in comparison with France, our wine brings here more than quadruple the price of theirs in their own country.

It would not be advisable, however, to discard the cultivation of our grain or root crops; yet grape-growing, in New England, has been tested sufficiently to demonstrate that an agreeable and profitable return for industry is now offered us, and one which hitherto has been almost unsought.

REMARKS ON THE PROPAGATION OF THE VINE.

As there are numerous methods adopted in the propagation of the grape-vine, it is important that those who are interested in its culture should possess a knowledge of the best modes of multiplying and extending it. The prudent vine-planter, therefore, should start on the principle of "adapting means to ends," not only by selecting such varieties as would be suited for his locality, as well as for the object he has in view, whether it be for table use or making wine—for restoring old vineyards by engrafting, or establishing new ones by cuttings or layers, but by producing new varieties from seeds, as well as hybridizing those already grown with each other, and employing the seeds of their products for the purpose last named. If he possess an old vineyard, the vines of which have become diseased, but having sound roots, or vineyards composed of varieties which he could more profitably convert into others, the engrafting of approved sorts into the stocks, or roots, of such vines would be the most eco-

nomical and expeditious method to pursue. It may be remarked, however, that it would be useless to attempt engrafting the finer kinds of the European grape upon American stocks, in any part of the United States subject to sudden atmospheric changes, intense heat, and frequent rains; for, the leaves of most of the European varieties are too tender and succulent to withstand the vicissitudes of such a climate, being unprotected by a downy or woolly covering which characterizes most of our indigenous vines. But, on the contrary, in the mild climates of Europe, California, and other favored localities, where it is desirable to obtain a more vigorous growth in the vines, the roots of any of the American species may be employed as stocks for grafting.

The only important advantage in propagating the grape from seeds is the production of improved varieties, more hardy or of better quality than the originals. Although it is by no means certain that such results would be obtained without a great number of trials, yet experiments should be made, and if too expensive for private persons, to be done either by a State or by the General Government. The same rule would apply to hybridization, except in the advantage of uniting a property of one kind of grape with that of another. For instance, if the stigmas of the Concord or Hartford Prolific were fecundated with the pollen of the Black Hamburg, Chasselas de Fontainebleau, White Frontignan, White Muscat of Alexandria, or other delicate varieties, the result would be a hybrid fruit, the seeds of which, if cultivated, in most cases, would probably produce a grape partaking of the properties of each of the parents, being hardier, on the one hand, and of more delicate flavor on the other. But when it is desirable to multiply and retain the qualities of any known variety, resort must be had to propagation by cuttings or layers, as there is no certainty of producing identically the same kind of fruit either by grafting or from seeds.

Of the great number of modes of engrafting the vine, the "cleft," or side-graft, inserted in or near the root, probably is best adapted for the restoration of a vineyard, as denoted on Pl. V. Fig. 1, *a*, *a*, *a*, represents the graft, cut in proper form, and inserted in the stock, *b*.

The proper season for grafting, in the Middle and Northern portions of the United States, is March and April, in clear, dry weather, and a month or two earlier in other parts, or at the period when the sap begins to ascend, although the operation may be performed from December till May. A damp or wet season is regarded as unfavorable. The cuttings should be secured several weeks in advance, and preserved in moistened moss, or by burying in the earth, in order that they may contain less sap at the time of grafting than the stock into which they are to be set. Indeed, these conditions should be strictly regarded, in order to insure complete success. The cuttings should be of medium size, about a foot in length, but varying according to the distance of the eyes apart. Having chosen those intended to be used, the stock or root should be uncovered, cut off at right angles, taking care not to injure the bark, and the incision for receiving the graft made a little below the surface of the ground, in the

form of a thick knife-blade, as indicated in the transverse section at *a b*. The cuttings may have four or five eyes, or buds, although two or three will do. After cutting the lower end of the graft, just below a joint, in order that a bud may appear directly above, in a form to coincide with the cleft in the stock, it is best to insert it in such a manner that the bark of the two parts will correspond. Generally, no ligature will be necessary, as the cleft will hold the cuttings firmly, those very young and tender only requiring it. The sides of the graft are then excluded from the air by the application of well-worked clay, or a preparation of green cow-dung and fresh loam, mixed in equal proportions, and the earth drawn back in the form of a cone, so as to leave but one bud visible, as shown in Fig. 1 at *a*. It may be remarked that old vines generally require to be grafted lower than young ones, as the wood is healthier at or near the roots.

In propagating from cuttings, it is always preferable to start them under glass, as the cultivator will not only gain several months' growth by early planting, but can control the temperature, moisture, and light, thus forming the climate to suit his case. But if he has not this convenience, he must resort to open culture, modified by frequent waterings and temporary shade. In selecting the cuttings, they should be taken from vigorous vines, of the desired variety, at any time between the fall of the leaf, in autumn, and its bursting in the spring, it being preferable to embrace a portion of old and new wood, each containing at least two buds, situated as near as possible to each other. If long kept before planting, they should be preserved in a cool place, buried in earth, or surrounded by moistened moss. Whenever it is desirable to transport them to a distance, either by sea or on land, through warm climates or cold, it can safely be done by soldering them up hermetically, in metallic cases, with about their own bulk of garden soil, sufficiently moist, but friable, for ordinary cultivation. I have repeatedly opened cases of this sort, in the months of May and June, which had been closed in the south of Europe and north of Africa the December or January preceding, and found the cuttings in excellent condition, most of them in a growing state. By starting them in propagating houses, they made shoots in the course of the season of several feet. As the bud near the bottom of the cutting must necessarily emit its rootlets at once into the earth, and thus establish a communication between the general system of the plant and the medium from which its food is to be derived, it is indispensable that the bark of the cutting should be removed at a point within half an inch of the eye, or bud, from which the germ must proceed. A good operator, therefore, always takes care that the lower end of his cutting is pared off as close to the base of the bud as may be practicable, without actually destroying any part of the bud itself, in any of the three methods indicated in Fig. 2, Pl. V, which are of a natural size, as near as may be, cut of the proper shapes and lengths, and planted in the earth or pots at the depths as represented. By this means, the first emitted rootlets, instead of having to find their way downward between the bark and wood, strike at once into the earth, as shown at *c c c*, and become a natural

channel by which nutriment is conveyed into the general system of the vine. In due time, one or other of the buds pushes a stem upward into the light, attracts the nutriment absorbed by the rootlets, and thus stimulates the latter to increased action. Ultimately, the lower parts of the cuttings begin to heal, and new rootlets descend between the bark and wood from all the buds, until they reach the earth, into which they pass like the first. The advantages of selecting cuttings containing only one bud each, are when they are rare or scarce, a larger number of plants can be obtained, and. in the opinion of some, by either of these two methods, a stronger vine will finally be produced.

If the propagation is conducted within doors, the cuttings may either be planted in shallow boxes or earthern pots, as early as February or March. The boxes may be made of any convenient dimensions, having a depth of 8 or 10 inches, the bottoms perforated by boring holes, in order to admit the circulation of moisture and air. The pots may vary from 4 to 6 inches in diameter. First, the bottoms of each may be covered to a depth of 1 or 2 inches with fragments of oyster-shells, pottery, or bricks, which may in turn be slightly covered with moss, hay, or straw, to prevent the descent of the earth above, and the remainder of the box or pot may be filled with the following compost:

	Parts.
Brick dust	1
Sand	1
Leaf mould	2
Loam	2

If these materials cannot readily be obtained, a mixture of equal parts of sand and loam may be employed.

Preparation having thus been made, one cutting may be planted to each pot, or several to each box, at a distance of about 2 inches apart, in the manner and about the depth indicated by Fig. 2, Pl. V.

If it be necessary to resort to propagation out of doors, a site must be selected in April or May, shaded artificially or otherwise during the hotter parts of the day, and either pots or boxes employed as above. In both cases, copious waterings must be made at first in the morning and evening of each fair day, conducted so as not to allow the direct rays of the sun to fall upon the young leaves while wet, which would cause them to blister, and destroy the plants. These waterings should gradually be lessened as the cuttings develop themselves, yet continued sufficiently to keep up a healthy growth. The cuttings within doors may be removed to the open air as soon as the season is free from vernal frosts, and watered, as far as necessary, in the course of the summer and fall. After their leaves have fallen, in autumn, they may be transplanted into nursery lines, or transferred to the sites where they are finally to remain, due care being observed to protect them from frost and drought.

In propagating the vine from seeds, choice may be made of those of the best varieties, half hardy or otherwise, when the fruit is

mature. If intended to be kept for a long time, or transported to a great distance, the seeds may be dried in the grape and taken out when required for sowing, which may be covered in boxes or pots, within doors or out, and afterwards treated in a similar manner as the cuttings just named.

D. J. B.

FRUIT-CULTURE.

SHALL WE DISPENSE WITH FRUIT?

BY L. E. BERCKMANS, OF PLAINFIELD, NEW JERSEY.

[Condensed from the Proceedings of the Seventh Session of the American Pomological Society.]

Of late, a great deal has been written about the cultivation of fruit trees, and especially in regard to the pear. Discouraged by partial or local failures, some have contended that it was impossible to grow pears with any prospect of certain profits, while others have said as much against the peach and grape-vine. We have no reason to stand up in defence of any species of fruits; but, taking a general and unprejudiced view of the matter, we may express our surprise in witnessing these efforts to restrain the cultivation of useful products and that on the part of gentlemen who are willing to try every experiment, and every remedy to promote the raising of field or garden crops, often more uncertain than those of fruit trees. If those writers would only cast a glance over the products destined to the sustenance of man and animals, or to the dainties and luxuries of our tables, how much more reserved they would be in their attacks!

"Can or shall we dispense with fruit and confine ourselves to corn, wheat, rice, &c.?" By a wise provision of Nature, the fruit crops follow each other in succession, so as to enable us to satisfy throughout the year, our natural cravings for fresh fruit. The strawberry is succeeded by the currant, raspberry, and gooseberry; by the apricot, early apples, plums and peaches; then come the pear, the grape, and the late apples. We mention only the natural products of given localities, and not the supply from distant tropical points. We should like to see every locality and latitude depend mainly upon its own resources in cases of emergency, as they depend upon their own field crops. Home-grown fruit is generally in a better condition than transported fruit; and, if not altogether as good in quality, it will keep better and cost less.

But to return. Shall we give up the cultivation of some sorts of fruits, on account of a few drawbacks, and dispense entirely with these? We could as well ask shall we give up the tomato, the egg-plant, the melon, the okra, which cannot be considered as indispensable food, but only as luxuries and dainties, because they are not

mere necessities, or because they require so much care and watching, and are exposed to so many failures? What has become an article of diet or luxury for the mass, has either to be raised at home or imported at double cost. There is no protesting against that. Pears and grapes, if neglected and given up at home, will as surely be imported as silk and lace. Who ever thought of giving up the cultivation of the potato on account of the rot and its many ruinous failures, or the wheat for the rust, the fly, or the weevil, or the grape for the oidium? Is a melon less cultivated here at the North, because it requires so much watching and protecting, or the egg-plant or Lima bean abandoned, because they are so uncertain, or are our best vegetables discarded because exposed to the ravages of a host of insects, spring frosts, and other drawbacks? No, we struggle and toil, and try again, and more highly prize that which costs us the greatest efforts.

It seems rashness to condemn a certain sort of fruit because one or two men have failed, in limited, poor localities, in ungenial latitudes, and because, in the bitterness of their disappointment, they write and write again to discourage others. It is one of our weaknesses to judge about everything from a limited and narrow point of view. A gentleman, after years of successful cultivation, finds out, one season. that the borer has taken hold of his apple trees, or that the "yellows" and the borer are destroying his peach orchard. Instead of trying other fruits or remedies, he yields to an impulse of disgust and disappointment, takes his pen and writes a bitter Philippic against apples and peach trees. Is that the way we have to do? These are partial, local failures, grains of sand in the vast ocean, and ought not to be mentioned by men of enlarged and comprehensive intellects. If, induced by their verdicts, we abandon the fruit-culture, because such a culture would not pay in certain cases, what would the people of the Union do? How could they be persuaded to dispense with apples, pears, peaches, or grapes? The mere supposition of such a gap in our markets, now that the public is used to all these luxurious and wholesome products, and fully appreciates the healthful influences of a bountiful consumption of fruit; the mere supposition of such a deficiency would seem as ridiculous as the idea of dispensing with tomatoes, cabbages, celery, and rhubarb, which are no more to be considered necessaries of life than a peach or a pear.

Alphonse Carr, the French humorist, once wrote in his "Hornets:" "Let the strawberries fail for three days in the Parisian market, and there will be a revolution;" and, in a certain measure, this is true. Suppose we had to get along without apple pie—dried peaches and apples, not to speak of fresh fruit, still more conducive to health, more emphatically indispensable—and what would be the result? Apples would sell, as once in San Francisco, for $2 or $3 apiece. One of my friends assured me that he saw Oregon apples sold for $6 apiece; but let that be, it is enough to show the eagerness of all of us, from the child to the oldest man, to get hold of a fine fruit.

Since, then, it must be admitted that fruit is not only a luxury but a necessary article of food and human diet, shall we not do for fruit

crops what we do for field crops? The same amount of labor which is required for two hills of corn or potatoes, bestowed on a fruit tree, will most always insure its success. If crops fail for a year or two, one good season pays for all. Even our field crops would have little to suffer from the presence of some fruit trees, kept under judicious treatment. All we have to do is to try to find out what our soil can and will produce. Few soils are unfit for all sorts of fruit trees. In places where no corn or rye will grow I have seen many a goodly acre covered with the Catawba and Warren grapes, and yielding from $400 to $600, in soils abandoned as unfit for every other cultivation. South Carolina and Georgia will soon be awake to this new enterprise, and acres upon acres of land not worth $5 are going to be converted into vineyards to supply the Union with wine, equal if not superior to any Hock or Madeira. Because Cincinnati has failed for the last two seasons to produce the usual quantity of wine, are the gentlemen of Ohio going to give up the cultivation of the grape? Please to ask them if their winters were not so severe, or other causes interfering, would there be any diminution in the yield of their vintages? And because France, Italy, Madeira, and Spain have seen their vineyards destroyed by the oidium, for years in succession, are they going to cut down their vines? No, they resort to every means to cure, to restore; they struggle manfully, with redoubled energy, and they, at last, have conquered and subdued the enemy. What a difference compared to the fastidiousness and puerile disgust of our fruit cultivators! What are the borer, the yellows, the blight, all taken together, when compared to that scourge of the French vineyards, the oïdium? and still they did not talk of uprooting their vines, but went to battle with the aid of science and experience, and after years of ruin and disappointment they have restored, at least partially, vigor and health to the once despaired of grape-vines.

And now because the vine and peach cannot bear 25° below zero; because some localities are infested with the borer, or the blight; because one sort of fruit does not succeed all over the Union, in damp and dry, cold and warm soils, shall we abandon their culture?

This year, the pear, the apple, and the peach are failures in large portions of the Union, although I saw splendid crops all over the South. The cherry failed here, so did grapes, and even the blackberry was scarce; is that a sufficient reason to write against these crops, when the field crops are in a still more precarious condition? All we have to do is to study our climate, our horizontal and vertical latitudes, our peculiar localities, our soils and their constituents, in order to find out the aptitude of our localities, to produce certain sorts of fruit; to look out for hardy, prolific, profitable varieties among every species of fruits; to study the wants and resources of the markets, and fruit cultivation will prove to be as profitable as any other business, now that every business has proved so fallacious and so uncertain.

The profits of the farm, orchard, or vineyard, although uncertain, and exposed to many failures, are just now as good and as much to be depended upon as the profits of good commercial transactions.

Let us not discard a fruit tree because it does not yield a certain profitable crop every year, or because it is subject to a few diseases or inconveniences. What are these compared to the dreadful scourges of the field crops, the rot, the Hessian fly, the rust, the boll-worm, the mould, the heavy rains or freshets, the protracted droughts, which yearly destroy thousands of acres of wheat, potatoes, cotton, &c., while, in the same soil, the sturdy apple tree, the vine or peach tree, plunge their roots deep into the subsoil, and live, thrive and yield crops in the middle of the ruins of the withered or rotten products of the fields.

I must repeat it again, let us find out what kind of fruit is suited to our locality, and what varieties are to be selected in that family; let us only cultivate the most vigorous among the good varieties, and not vainly struggle against Nature's laws, in obstinately cultivating fruits unfitted for the locality, or only good for the catalogue of an amateur. Let us consider that fruit-culture requires as much book farming, as corn or clover crops, although many think it sufficient to stick a poor tree, on which a poor variety has been budded, in a poorly prepared soil; and, because it is a tree, is expected to grow in opposition to all the laws of Nature, and under a treatment which they should be ashamed to give to a corn or potato hill. Let us not discourage others because a few of us have failed in some of our expectations. The field is large, and the resources in varieties of fruit immense.

We have a wide area, a better climate, generally speaking, for fruit crops than Europe. I can safely state that I have seen more fruits of the choice kinds in a single exhibition in Boston or Rochester, than in twenty of the best exhibitions of Europe, where at least fifty fruit trees are cultivated upon a given place for one growing here; where (as in Germany) the government compels the farmer to plant the roadsides with fruit trees for the benefit and relief of the poor or thirsty travellers. Why shall we turn in disgust from that source of health and luxury, because a few fail, and write their impressions in a bitter mood of disappointment? The successful fruit-grower enjoys the satisfaction, pockets the money, and says not much; he knows that a fruit tree requires no more trouble or extra care than a few cotton plants or a cabbage; pays better, lasts longer, and, in a compared series of seasons, has paid five times more for the place occupied, than the very best of his market produce, with perhaps not half the expense. Let us keep up the fruit-culture, or some of our neighbors will supply our markets. Let us try every variety; what has been done years ago can be done again; better and more hardy sorts of fruits can take the place of old varieties; and chiefly let us consider that fruit is as necessary an article in the markets as any of the products of our gardens or fields.

PROFITS OF PEAR-CULTURE.

[Condensed from the Annual Address of Marshall P. Wilder, President of the American Pomological Society, at its Seventh Session.]

Can pears be grown at a profit? This inquiry has been satisfactorily answered by pomologists; yet the responsive facts and arguments deserve to be embodied and published under the sanction of this National Assembly. To a record of these, as collated from various authorities, so far as they are confirmed by personal observation and experience, I now invite attention.

The Fruit Growers' Society of Western New York, composed of gentlemen of deserved integrity and celebrity, furnish the following instances from that section of the State:

Three White Doyenné pear trees, owned by Mr. Phinney, of Canandaigua, one of them small, produce annually from $50 to $60 worth of fine fruit. A tree of the same variety, seventy years of age, owned by Judge Howell, of the same place, has not failed of a good crop for forty years, averaging for the last twenty years, 20 bushels, and sold on the tree at $60 per annum. This tree has produced for the New York market $3,750 worth of pears. Three large trees owned by Judge Taylor, of the same kind, yielded 11 barrels, in 1854, and sold for $137. A young orchard, owned by Mr. Chapin, of four hundred trees, eight years from planting, produced 15 barrels, in 1853, selling in New York for $450, and 50 barrels in 1854, yielding him $1,000.

Similar results have been realized in the State of Massachusetts:

William Bacon, of Roxbury, has about an acre devoted to the pear. The oldest trees were planted eighteen years ago, but more than half within a few years. From two trees, the Dix and Beurré Diel, he has realized more than $100 a year, and for the whole crop over $1,000 per annum. John Gordon, of Brighton, has 3¼ acres, commenced in 1841, there being only eight trees on the ground. There are now twelve hundred trees, planted in various years, more than one-half since 1854. The amount received for his crop from that date to the present, has been from $500 to $600 a year; but he remarks: "If I had confined myself to a judicious selection of varieties, it would now bring me $2,000 a year." William R. Austin, of Dorchester, has an orchard of between five hundred and six hundred trees, mostly on quince roots. These trees are about twelve years of age. One hundred are Louise Bonne de Jersey. They commenced bearing about three years after planting, and have borne regular crops ever since. They are healthy, and only eight of the whole number have died since the orchard was commenced. No account of the crops was kept until the year 1851; but Mr. Austin's sales for the next six years, amounted to $3,408. The Messrs. Hovey, of Cambridge, have a very large collection of bearing trees. From two rows, two hundred and ten trees, grafted on the quince, the crop has amounted, some years, to 25 barrels. John

Henshaw, of Cambridge, planted about an acre, principally with pears on the quince. On the fifth year after, he gathered 120 bushels of pears, 70 of which he sold at $5 to $6 per bushel. A Buffum pear tree, at Worcester, belonging to Mr. Earle, yields annually from $30 to $40 worth of fruit. Mr. Pond, of the same city, planted, in 1850, three hundred and fifty Bartlett pear trees, a year old from the bud. In 1857, he sold from these trees 50 bushels of fruit at $5 per bushel, or $250 for the crop.

Similar instances of success in these and other States might be multiplied, if time would permit, to prove the age, health, and profit of the pear. So deep has the conviction of this truth become, and so uniform the success, that, instead of planting single trees, as in former times, cultivators now plant orchards of hundreds and thousands, in firm and reasonable expectation of large incomes. Such facts are conclusive, and ought to rectify the false theories which have been advanced on this subject.

CIRCLE CULTURE OF FRUIT TREES.

BY JOHN J. THOMAS, OF UNION SPRINGS, NEW YORK.

[Condensed from the Proceedings of the Seventh Session of the American Pomological Society.]

I have examined with some care the length of the roots of my dwarf pears, set out last year, on my newly-occupied place, at this village. They were two years from the bud when transplanted, and are the oldest dwarf pears I have. Although the trees have had moderately good, but not high and rich culture, I find no difficulty in tracing the roots 3½ feet from the trees, beyond which the fibres become too small to follow easily through a dry and tenacious soil. They have evidently extended over 4 feet; and small and young as the trees still are, they have consequently formed already a circle of roots 8 feet in diameter. I have no doubt that in richer and more porous soils, the roots would have run to a greater distance.

A most important suggestion is afforded by this fact—the indispensable necessity of great breadth of culture, when applied to young trees. These, it will be observed, are dwarfs, and the quince stocks on which they grow are generally supposed to confine their roots to a comparatively small circle; yet this circle has already a diameter nearly twice the height of the trees. The practice, then, of digging circles about the stems, instead of cultivating the whole surface, is comparatively useless, unless those circles are of a size to cover the whole extent of the roots, besides the soil which the roots of the surrounding grass may penetrate. It is not unusual for the grasses to send out fibres 2 feet; but admitting the distance ordinarily to be only a foot, then there must be dug a ring a foot wider on every side of the tree, if we would prevent the grass from injuring the

newly-extending roots of the tree. Two feet added to the eight-foot circle already required would make 10 feet, the smallest dimensions for cultivated circles for dwarf pears the second year from transplanting when surrounded by grass land. When the trees have grown a few years more, the cultivation should extend much further. In other words, it should cover the whole surface; nothing less will answer under any circumstances.

There are many who do not cultivate their trees at all, but allow them to stand in ground occupied with weeds and grass or hardened by summer drought. The roots of such will not, of course, travel very far, and they will make but little growth or remain stationary. There are many others who think it quite sufficient to spade a small circle around each; and the rule once given by Downing and copied since by other writers, is to extend the circle as wide as the spread of the branches, on the supposition that the roots run equally far. The heads of my dwarf pears, already spoken of, average 2 feet in diameter. A dug circle of this size, according to the rule, would be only one-fourth the diameter of the roots, and extend over but a sixteenth of their surface, exerting scarcely a perceptible benefit.

The practice, then, of digging circles may be set down as positively injurious by inducing cultivators to believe they are doing something really useful, when, in fact, they are doing almost nothing at all. It should be wholly discarded. and thorough, broadcast culture only relied on in all cases.

The dwarf pear, the plum, and the peach, especially, require constant and thorough cultivation. They cannot succeed in grass, where the apple and cherry might flourish well. I have long since discovered that spaded circles scarcely benefit the peach, and, a few years since, I performed an experiment to determine definitely the distance at which the peach would draw nourishment through its roots. A dozen trees of the same size and variety were set out on a piece of uniform land, and were cultivated for a few years, until about 10 feet high, when the land was laid to grass. A portion of the trees were within 3 feet of a compost heap, the rest at various distances. Those standing nearest the compost, made a summer's growth of 4 feet 8 inches. The tree that stood 7 feet off, almost as far as the height of the tree, threw out shoots nearly 2½ feet long. The next, at a distance of 15 feet, made shoots 14 inches long, while all others, 20 or more feet distant, grew but 7 inches.

Thus we see that a peach tree, 10 feet high, was doubled in its linear growth by a heap of manure, 15 feet distant, from which only a small portion of the roots on one side could derive any nourishment, proving conclusively that the roots must extend on each side to at least an equal distance—that is, that they form a radiating circle of fibres no less than 30 feet in diameter, or three times as great in breadth as the height of the tree. How perfectly futile the attempt to benefit such a broad surface by spading a circle, 2 or 3 feet in diameter, which would be but a hundredth part of the whole area of the branching fibres.

I might state other facts, if necessary, tending to establish the

truth of the position here laid down, but the preceding are sufficient, and do not admit the errors which sometimes escape experiments of a more random character. I furnish these merely as a small contribution toward the effort to induce planters, generally, to give their fruit trees that attention which they so eminently deserve, and which is absolutely essential to their good growth, and the full development of the highest quality of the fruit. Until proper attention and thorough cultivation is given the trees, we shall not cease to hear stories of disaster and failure of their fruit.

POMOLOGICAL RESOURCES OF THE SOUTH.

BY D. REDMOND, OF AUGUSTA, GEORGIA.

[Condensed from the Proceedings of the Seventh Session of the American Pomological Society.]

The pomology of the South in many respects is quite peculiar and distinct; and as our section has heretofore scarcely been represented, it may not be improper to offer a brief statement of our experience of cultivated fruits, with some hints on our modes of culture, and notices of Southern seedlings, &c.

APPLES.

A great deal of error and misapprehension has heretofore existed in regard to the capacity of the South for the production of the apple; and, even now, one will find thousands of intelligent persons who fully believe that it is impossible to raise winter apples here, and that it is necessary to look to the North for a supply of long-keeping varieties. The labors of a few zealous pomologists, in the Carolinas, Georgia, Alabama, Tennessee, and other sections of the South, however, within the past eight or ten years have brought to our notice a large number of native Southern apples—mostly, perhaps, chance "wildings," but many known to have been carefully planted from the seed and fruited by the Indians and early white settlers of the country. The best varieties of these seedlings have generally been found in the mountainous and middle portions of the Carolinas and Georgia, though excellent late sorts have also been produced in Mississippi, Alabama, and the southern or lower portion of the States before mentioned. Many of these apples are superior in size, flavor and appearance, and fully equal in keeping qualities to the best apples of the North; and it may, therefore, be taken for granted that the South can raise apples in abundance and of the very best quality, if her people will only select their own native varieties, and cultivate them properly. Indeed, after many years' experience, with nearly every variety of fruit, we are prepared to rank the apple as the surest and most reliable of all our fruits, except the grape, and one which

seems to adapt itself very readily to all soils and localities. I have seen, the present season, thrifty and vigorous trees, loaded with fine fruit, from the lowlands of the seacoast, in the neighborhood of Savannah, to the mountain summits of Tennessee: and nowhere in the South have I known the apple to fail, when it has received anything like proper attention. It would, perhaps, be difficult to give a selection of varieties adapted to the entire South; but I think the following can hardly fail to succeed in most sections. I may here remark that nearly or quite all the early summer varieties of the North do well with us; but that the Northern fall and winter sorts, especially the latter, are of no value whatever in our climate, as the heat of our spring months forces them into premature ripening and causes them to fall from the tree and decay. The South must, therefore, look to her own native seedlings for long-keeping varieties, and a proper selection of these cannot fail to be successful, as long experience has proved. The "Shockley" apple, a Georgia seedling, has often been kept in perfection from November to June; and the "Carter," an Alabama seedling, will hang on the tree in that latitude, 32°, sound, crisp, and firm, until Christmas.

LIST OF APPLES FOR THE SOUTH.

Summer Varieties—Northern—Red Astrachan, Early Harvest, Sweet Bough, Early Joe, Red Margaret, and Early Strawberry.

Summer Varieties—Southern—May Julian, Carolina Red June, Family, Wonder, Aromatic, Defiance, Washington County, Horse, Green Horse, Nantehalee, Summer Sweet, and Farrar's Summer.

Autumn Varieties—Northern—Rome Beauty, Smoke House, and Talpahocking.

Autumn Varieties—Southern—Batchelor, Carolina Greening, Disharoon, Taunton, World's Wonder, Yopp's Favorite, Black Warrior, Kennedy, Rhode's Orange, Autumn, and Wine Apple.

Winter Varieties—Southern—Abram, Augustine, Berry, Blackshear, Buff, Bryar's Red, Boatman's, Battlefield, Buncombe, Carolina Russett, Cherokee Red, Cloud, Cook's Red, Carter, Camak's Sweet, Chestatee, Cullawhee, Cullasaga, Davis, Equineteley, Elgin, Epting's Winter, Epting's Premium, Elarkee, Foust, Ferdinand, Firkin, Frey, Gore, Gowdie Gully, Green Crank, Gordon's Seedling, Golden Pippin, Southern Greening, Pomaria Greening, Hoover, Hall, Hammond, Hameter's Late, Holly, Henley, Holladay's Seedling, Junaluskee, King Tom, Kittageskee, Lexington, Lorick's Cluster, Lever, Summer's Late Striped, Limber Twig, Mill's, Mead's Keeper, Meadow Woods, McDowell's Winter, Mangum, Meyers', Maverick's Sweet, Moultrie's Winter, Mattamusket, Nickajack, Neverfail, Nonpareil, Nix's Green, Nequassa, Oblong Crab, Oconee Greening, Perkins, Clark's Pearmain, Carolina Pippin, Albemarle Pippin, Abram's Pippin, Brock's Pippin, Peake's Red, Peake's Yellow, Price, Pound, Red Warrior, Raban, Residence, Rhyne, Salem, Shockley, Stevenson's Winter, Santa, Strother, Selma, Santouchee,

Tryon, Tenderskin, Thurmond, Wall, Wateree, Wilfong, Walker's Yellow, Yellow Crank, Yahoola, Yates.

From the foreging list, embracing nearly one hundred varieties of native Southern winter apples, of superior quality, it will be seen that our pomologists have not been wholly idle, and that we have, at least, inaugurated something like a nomenclature and classification adapted to our section. At a late meeting of the Georgia Pomological Society, held at Athens, there were exhibited five hundred and sixty-eight lots of fruit, including seventy-four varieties of apples, one hundred and forty-four of pears, ninety-nine of peaches, thirty-four of plums, eleven of grapes, and other fruits in proportion—all of which we cannot but regard as highly encouraging, when we consider the very brief existence of the Society, and the little interest heretofore manifested in the culture of the finer varieties of fruit.

The apple, so far as my observation extends, is liable to no diseases of consequence, and may be considered a safe and profitable tree for extensive planting, especially if the winter varieties are selected. The summer varieties ripening at the same time with the strawberry and the peach, have the superior flavor of these fruits to contend with, and are not therefore so desirable, nor so much sought after.

PEARS.

The same feeling of dependence upon other sections and distrust of our own resources, which has heretofore prevented the extensive culture of the apple, has retarded the planting of the pear, though wherever this delicious fruit has been fairly tried, it has attained a size and flavor nowhere else known. Indeed, we have much reason to believe that in the South only is the pear destined to arrive at its highest development and perfection; and that it can here be grown with that certainty and profit which alone justify the care and attention which this somewhat fastidious and exacting tree demands. Most of the leading varieties known and cultivated at the North, succeed well in the South, either as dwarfs or standards, the principle requisites being deep, mellow, and careful culture, and the training of the top of the tree very low and spreading for the purpose of shading the trunk of the tree, and the earth over the roots, from the scorching and blistering rays of the sun. With this system and a liberal enrichment of the soil, by proper fertilizers, the pear with us does not seem to be liable to any diseases of sufficient consequence to deserve mention. We have not, as yet, succeeded in producing many Southern seedling pears of marked excellence, though we doubt not that we shall be as fortunate as we have been with the apple, when the attention of our pomologists is more fully directed towards the production of fine new sorts from seeds. The example of our distinguished friend, Dr. L. E. Berckmans, and many others, in raising from seed and planting large pear orchards, of all the established varieties, in various parts of the South, will, we trust, give quite an impetus to the culture of this magnificent fruit.

ALMONDS.

The almond grows thriftily, but the fruit is almost invariably killed, north of 32°, by the late spring frosts. The Chestnut, Madeira nut, and pecan are more certain; but, as yet, have not received much attention.

PEACHES.

The South is the true home of the peach; and it attains with us, undoubtedly, its highest degree of perfection. It has long been, and is yet, the favorite fruit of the people, no less for its intrinsic excellence than for the ease with which it may be propagated from seed, and the early period at which it comes into bearing. Thousands of the finest seedlings, unnamed and comparatively unknown, are scattered along the roadsides, in the open fields, and in the remote corners of fences and hedges. The tree will sometimes bear fruit the second year from the seed, and always the third; and, when "worked," succeeds well either grafted or budded. Our nurserymen have many superior sorts, almost unknown at the North or elsewhere, a few of the best of which I will mention: Amelia, Early Columbia, Baldwin's Late, Canary, Exquisite, Golden Ball, Lady Parham, Pocahontas, Elmira, Tecumseh, Julia, Bordeaux Cling, Eaton's Golden, Flewellen, Mitchell's Mammoth, Griswold, Henrietta, O'Gwynne, and White Globe. But perhaps the most attractive and valuable of our late additions to the list is the "Honey peach," of China, one of the most delicious of all fruits, and which cannot fail to become popular wherever it is known and will succeed.

The peach, however, even in our favored climate, has many enemies, and is liable to numerous diseases. Among the first is the borer, (*Ægeria exitiosa,*) which is generally very destructive. The use of boiling water, poured freely into a basin-shaped cavity at the collar of the tree to destroy grubs already formed, as a preventive, has been found very efficacious in may cases. But the most practicable and easy plan of destroying this insect, where the peach is largely cultivated, will be found to be the removal, in the fall, of the earth for the space of a foot, and the depth of from 3 to 6 inches, exposing the stem and collar of the tree to the action of the winter frosts; this cavity to be refilled in the spring with fresh earth, heaping it up into a conical mound, to a height of 10 or 12 inches around the trunk, and allowing it to remain so until fall again. I nave tested this method for some years, and cordially recommend it to the public. Upon the first removal of the earth, if any borers are found in the tree, they can be destroyed with the point of a sharp, slender knife-blade; and if the system above indicated is regularly kept up, it will seldom be necessary to resort to that somewhat dangerous tool afterwards. The berries of the "Pride of India" or "China Tree," (*Melia azedarach,*)

placed in the cavity around the bole, or trunk, of the tree, are also believed to act as a preventive of the borer.

When the peach tree receives anything like proper culture or attention, in our climate, it is liable to no diseases; and is far more thrifty and long-lived than in more northern localities. We have no "yellows," nor similar malady; and all that is necessary to keep the tree in perfect health, is judicious pruning (shortening in) and frequent stirring of the surface soil around it. We generally find it no disadvantage to raise crops of field peas, melons, or sweet potatoes in our peach orchards, provided the refuse of the crop, stalks, leaves, &c., is left on the ground, and the growth of foul grasses and weeds prevented by constant culture. The greatest drawback to peach-raising in the South is the liability of the fruit to be cut off by late spring frosts. The warm weather of February and early March generally forces the trees into blossom; and it too often happens that the succeeding frosts utterly destroy the crop and blast the hopes of the cultivator. The fruit is seldom destroyed in the blossom, and never while the buds are dormant in winter. The most trying and critical period with us is in the early part of April, after the blossom has dropped, and the fruit is about the size of a pea, though we have seen the crop destroyed at a much later period. I am not aware that any economical and practicable plan of saving this crop from spring frosts has yet been discovered, though partial success has attended the building of smouldering fires in the orchard, the retarding of the time of blooming, by pruning just as the buds begin to swell, covering the ground around the tree with a heavy mulch of leaves, straw, &c. I do not consider the peach crop as generally certain oftener than three years in five, and yet, with this serious drawback, it has been found profitable, by those who have railroad and other easy access to our prominent seaports, to plant very largely for the New York market, which has been supplied to a considerable extent for the past four or five years with early peaches from this State and South Carolina. We have in the South, for home consumption, a constant succession of peaches, mostly native seedlings, from the middle of June to the first of November—from four to five months—and, were there sufficient demand, we could readily ship this fruit to the North during the greater part of that time.

NECTARINES.

The nectarine is quite extensively cultivated among us, as an open air "standard" or orchard tree, and is equally as hardy as the peach. It bears regularly and as well, but is liable to the same enemies and disasters, with the addition of being far more attractive to the curculio, which finds easy access through its smooth and tender skin. I know of only two native nectarines, of which the "Southern White Queen" is the best.

APRICOTS.

The apricot grows vigorously, and is quite free from disease as a tree; but its extreme earliness of blooming and the almost certain liability of the fruit to be killed by spring frosts, render it rather undesirable for orchard culture. We occasionally gather very fine crops, however, and feel assured that if the trees were trained *en espalier*, so that they could be slightly protected, we should be much oftener gratified. A few samples of Southern apricots have been sold in the New York market at from $1 50 to $2 25 per dozen; which prices would justify far more care and attention than this delicate and rare fruit generally receives. A few native seedlings have been produced; but the "Oglethorpe" is the only one of particular merit with which I am acquainted.

PLUMS.

The plum grows vigorously everywhere in the South, and is not at all liable to the "black knot," or other serious maladies. It is, also, for some inexplicable reason, less subject to the attacks of the curculio than at the North; and, when pigs or fowls are confined within the orchard, and allowed a free range, we generally find no difficulty in raising fair crops. We have a few new seedlings of decided merit, and have growing everywhere, in the borders of our woods, along water courses, and in old fields, several wild varieties of Chickasaw and Cherokee plums, scarcely inferior to many of the cultivated sorts.

CHERRIES.

The cherry can hardly be said to succeed well with us, generally. The Morellos often bear good crops, and some of the finer varieties have partially succeeded, when worked on Mahaleb stocks, planted in rather moist soil, and trained with low, spreading heads. But we most cheerfully yield the palm of superiority in cherries to the North, which also possesses a climate more favorable than ours for the production of the currant, the gooseberry, the raspberry, and perhaps, the improved varieties of the blackberry—though, with this latter fruit, further experience is necessary. All the wild varieties of the bramble including the blackberry, dewberry, &c., grow luxuriantly and bear profusely in our woods and fields; and this fact would seem to promise success with the Lawton, Dorchester, &c.

GOOSEBERRIES AND CURRANTS.

The gooseberry and currant—two fine garden fruits of the North and of Europe—cannot be profitably cultivated in the South, and have been long since reluctantly discarded—nor have we had very encouraging success, thus far, with the improved varieties of the rasp-

berry. One or two native raspberries give us regular and good crops; but shade, mulching, and a damp locality, are essential for even these.

GRAPES.

In reference to the grape, I can only repeat the remark previously made in regard to the peach, namely, that the South is its "true home;" and that here it grows with a luxuriance, and produces fruit in such an abundance as is seen in no other portion of the Union, except, perhaps, California. We are just now getting into a "grape mania" at the South—planting vineyards largely on our hill-sides and in our old fields—forming vine-growing associations, and organizing joint-stock companies for the culture of the vine and wine making, &c. And this is not to be wondered at, when we see old and so called "worn out" land unfit for cotton or corn producing plants which, at two and a half years from the cutting, average thirty or forty clusters to the vine; each cluster weighing an average of half a pound, and each acre of vines capable, at this rate, of producing from 800 to 1,000 gallons of wine! Quite a considerable quantity of this wine has already been made, and the most experienced connoisseurs do not hesitate to rank it at least equal to the very best product of the American wine press, and superior, in all respects, to the often-adulterated and poisonous trash, imported at a high price. All the native varieties of grapes, such as Catawba, Isabella, Warren, Pauline, Lenoir, Scuppernong, &c., succeed admirably; and I have seen, the present season, the Black Hamburg, Golden Chasselas, Sweetwater, Black Chasselas, and White Muscat produce large clusters and ripen perfectly in the open air, in August. Though only at the beginning, as it were, of this enterprise, I hazard little in predicting that the time is not far distant, when the culture of grapes and wine-making will be second in importance only to the growth of cotton, at the South—and that the day is near at hand when every man among us may, literally, "sit under his own vine and fig tree," and drink his own wine, to the utter exclusion of those maddening mixtures which are the prolific causes of so much social and moral woe.

STRAWBERRIES.

The strawberry is one of the most profitable and easily cultivated fruits of the South—beginning to ripen early in April, and continuing, if freely watered, to give us a constant supply of fruit during four or five months. We have had strawberries at Augusta, nearly four months in succession, without artificial watering—though the average season is only about two to three months. Our native American varieties succeed best—the climate being too hot for the English and other foreign sorts, thus far as tested.

THE JUJUBE AND THE OLIVE.

The jujube and the olive may also be ranked among our fruit trees, and are worthy of attention. The jujube is just now beginning to be freely introduced into our nurseries and gardens, and deserves a place in all careful collections. It forms a medium-sized tree, with very singular tortuous branches, covered with long and formidable recurved thorns, and most beautiful, shining, dark-green foliage. The fruit is about an inch in length, oblong, of a brownish color, and having a flesh or pulp of the consistency and flavor of the dried dates of commerce, or a pleasantly sub-acid baked apple. The seed is also similar to that of the date—by which name the jujube *(Zizyphus sativa)* has sometimes been erroneously called. It grows freely from suckers, or pieces of roots, is very ornamental, and would make a defensive hedge of the most formidable description.

The olive has been successfully, though not extensively, cultivated on the seacoast of South Carolina, Georgia, and Florida, for many years; and fine samples of the pure oil have been exhibited at our Agricultural Fairs, by Mr. Robert Chisolm, of South Carolina; Colonel P. M. Nightingale, of Georgia, and others.

POMEGRANATES.

The pomegranate is a very beautiful and certain fruit with us, but the shrub itself is a little tender north of 32°. The fruit is never killed, as it does not come into bloom until all possibility of late spring frost is over. Like the orange and other tropical plants, it is a continuous bloomer, during its season—though not an evergreen—often displaying ripe fruit and expanding blossoms at the same time. The fruit has hitherto been of no commercial importance, and is scarcely known in the market; but its gratefully acid and cooling juice has been found most useful and refreshing in fevers; and its beautiful and inviting appearance renders it an attractive and desirable object for the dessert. The rind or skin of the fruit is very bitter; and, possessing tonic properties somewhat analogous to Peruvian bark, has sometimes been used as a substitute for that article by druggists.

The pomegranate grows readily from cuttings, planted in the winter; and, in addition to its other uses, is capable of making a very neat and defensive hedge. Three varieties, the "Sweet," "Sub-acid," and "Sour" are in common cultivation.

THE FIG.

Of all fruits cultivated in the South, the fig requires the least care, and is one of the most productive and useful. We have in common culture only four or five varieties, though the lists of nurserymen and amateurs embrace five or six times that number. South of 32°, the fig-tree produces three crops a year, commencing in May, and bearing

until November; but, in Central Georgia, we generally gather only two crops a year, unless the season is peculiarly favorable—the first. or early crop, being often killed by spring frosts. The fig is mostly eaten directly from the tree, as soon as ripe, and may be found in abundance upon the breakfast tables of all lovers of fine fruit. When ripe, it is mild, rich and luscious, without being at all cloying; and can be eaten to almost any extent, even by those of the most delicate appetite. It has little or no value for any other than the home market, being very perishable, when fully ripe; but preserved in syrup, dried after the foreign mode, or pickled, it might easily be made a crop of great commercial importance to the South.

The fig-tree grows very freely from cuttings, planted early in the spring, and will sometimes bear the first year—generally the second. The trees are sometimes cut down entirely to the ground by severe frosts; but they seldom or never fail to sprout again from the roots, and some varieties, like the Alicante, ripen a crop of fruit on shoots of the same year. It has ever been a source of surprise to us that this product is not extensively cultivated, and turned to more profitable account; but this is not the only instance in which the prodigal and generous gifts of Nature are lavished upon man in vain. We hear of gentlemen near Mobile, upon the Gulf, who have planted the fig largely, with the intention of using the fruit as Northern farmers use apples—for the purpose of fattening hogs; and though, as pomologists, we cannot but deprecate the bringing of this delicious fruit to such base uses, still, if at all inclined for the "flesh pots," we should prefer eating fig-fattened pork, to that fed on the offal of distilleries, or the filth and garbage of city streets.

This tree grows and produces best on a moist, alluvial soil; but readily adapts itself to all classes of land, altitude, and exposure. It is much inclined to sucker, but should be trained to one clean, strong stem, with a low, branching head.

QUINCES.

The quince is not cultivated among us to any considerable extent, and can only be said to do moderately well—except on heavy and retentive soils, where it seems to succeed nearly as well as at the North.

MULBERRIES.

The mulberry grows wild, and the cultivated varieties succeed everywhere. It sometimes produces continuous crops for three months in the year.

CONDENSED REPORTS

OF THE

AMERICAN POMOLOGICAL SOCIETY,

FOR THE YEAR 1858.

DISTRICT OF COLUMBIA.

FROM JOSHUA PIERCE, OF WASHINGTON CITY.

APPLES.

In this latitude, in our dry atmosphere and general gravelly and sandy soil, with our long, scorching summer heat, apples are apt to ripen too soon to keep for winter use. Most of the highly-esteemed varieties have been obtained from the North, and seem to mature much earlier than desirable. It has been thought that the late ripening Southern sorts would be far preferable and obviate this great fault. With this view, some public-spirited individuals are doing much towards experimenting, but time will be required before the result will be fully known.

The *Newtown Pippin* is the most extensively cultivated variety. Some seasons, in favorable localities, it is but little inferior to those of more Northern growth, yet it ripens too soon to be kept without much artificial help.

The *Baldwin* and *Belle-fleur* are great favorites and often very fine, but for abundant crops and long keeping, *Smith's Cider Apple* and the *Wine Sap* stand in the first rank.

The *Carthouse* and *Rollens' Juneating*, in some soils, are fine, but do not seem to be such favorites here as they are on the Ohio, where they are extensively cultivated for shipping to the Southern markets.

For early summer use the *Early Harvest*, the *Summer Rose*, and the *Bough Apple;* then in succession, the *Queen Apple*, for culinary purposes, followed by the *Swain* or *Cellar Apple* and the *Fall Pippin*, both good for the table and the kitchen; and after these, for later use, the *Wine* or *Hayes Apple*, sometimes known as *English Redstreak*, and the ever-popular *Rambo* and *Fall Catlin*. The Rambo brought to our market from the section bordering on the Potomac, near the mountain regions, has decided preference over those grown here, and is a great favorite for fall and early winter use.

PEARS.

The pear, for a few years past, had promised much; many went into its cultivation, both as a standard and a dwarf, with great hopes

of success; but the results were discouraging. The fire-blight, in the summer of 1857, exceeded anything known here for twenty or thirty years. It is thought that we can safely say that the destruction of that one season was equal to that of the whole thirty years previous. Our principal cultivators, though much discouraged, are still determined to persevere, and are looking for some preventive or cure. Great hopes have been indulged that from change of climate, or some other cause, this disease has passed away. We are not able to say from our observation whether it has been less destructive to those on pear bottoms or on dwarf trees, but many sorts seem to have escaped, while others alongside, with equal chances of soil, cultivation, &c., have been entirely swept away. In one case, a row of dwarfs, planted alternately with the Le Curé and other kinds, presents the curious spectacle of an alternate dead and living tree; and whole rows of some varieties with scarcely a living tree are to seen, while other sorts have almost entirely escaped. Though the American seedlings are less liable to be attacked than those of foreign origin, still they are not altogether exempt.

The ravages of the borer on the quince stock, when exposed above ground, have been such as to preclude a hope that it will be possible to have dwarfs without protecting them by planting the whole of the stock, up to the graft, under ground.

NECTARINES

The nectarine, owing to the curculio, is seldom found in perfection.

PEACHES.

The peach, next to the apple in importance here, has been quite a short crop for this and the past two seasons, owing principally to the intense cold of winter or the late frosts in spring. It has been our boast, heretofore, that in quality, we have not been behind other sections, but this season they have degenerated.

I would here suggest that cultivating the ground and thinning the fruit, both by aid of the knife, in February, or March, and by pinching with the hand, in May, or June, will greatly add to the size and value of the peach.

PLUMS.

The plum, always difficult to protect from the curculio, has had for a few years past to contend with the knot, or excrescence on the limbs, which seems to increase annually and threatens to end in extermination.

CHERRIES.

Many of our cherry trees have been destroyed by the intense cold of the two winters preceding the last, and the spring frost has been

so fatal to the blossoms that this fruit, with the exception of the Morello, has been almost a total failure.

GRAPES.

Grapes are grown in houses with much success, but not to that extent which the demand for the fruit would justify. In open ground, several vineyards are planted to the extent of 5 or 6 acres, and the success of this season warrants a belief that much may be done, both in fruit for the table and for wine. The new varieties are finding their way here, and promise well.

GOOSEBERRIES.

In gooseberry-culture, but little has been done here, as the well-known difficulty with the mildew or mould in the fruit has prevented planting to any considerable extent. But the currant-culture, which is easy and remunerative, has much increased.

BLACKBERRIES.

The blackberry is here beginning to claim a share of cultivation. The "Lawton," from the great abundance and size of its fruit, has been much planted; but among our native sorts, such is the size and excellence of many, that no doubt some will be found better adapted for market purposes, as the acidity of the Lawton forms an objection. The two winters previous to the last, the bushes were almost all killed to the ground, which had rarely occurred before.

RASPBERRIES.

The raspberry, for several years, has been almost a total failure, from the destruction of the canes by the cold. The mildness of the last winter induced the hope that for once they had escaped, but it is a fact that the destruction was greater than usual. So fatal has it been that no opportunity was afforded of comparing the relative merits of the newly introduced kinds.

The "Catawissa" seems to gain much favor as a market fruit, for the fall season, and is justly regarded as a valuable acquisition. Strong hopes are entertained that much improvement may be secured by hybridization with other sorts.

STRAWBERRIES.

The strawberry here has received great attention. Our markets have been well supplied, though for the last two seasons the crop was far from equalling the expectation of the cultivators. Many of the new kinds have been introduced, and promise well. Some of them, no doubt, will displace the two sorts which have principally been relied upon as the most remunerative, namely, "Hovey's Seed-

ling" and the "Alice Maud." The foliage of the latter, like most of the foreign varieties, was so much injured by the scorching suns of 1856 and 1858, that some are disposed to abandon it, but the Hovey continues to be a favorite.

CRANBERRIES.

The cranberry is found in some localities in such perfection as to leave no doubt that it might be cultivated as a source of profit, though it is not known that any such attempt has yet been made.

CONNECTICUT.

FROM T. S. GOLD, OF WEST CORNWALL.

APPLES.

Within the last twenty years, the orchards in this part of the State have rapidly failed, many old trees dying or ceasing to bear good fruit. Decay dates from the ice storm of 1855–'6. Within ten years, I have planted five hundred trees, most of which are now in a tolerably thrifty condition, and some are beginning to bear. The insect pests are very numerous, embracing the common caterpillar, (*Clisiocampa americana,*) which makes nests in early summer, a smaller one that makes nests in August, a large, coarse-haired worm which lives in families but does not make a web, (*Eumetokoma ministra,*) a little worm that eats the tender shoots in summer, and the scale-insect, or bark-louse; but these are all harmless compared with the borer (*Saperda bivitata*). By washing the trunk repeatedly with a compound of whale-oil soap, sulphur, and fresh manure of cattle, the trees are partially protected, but after all, the chief dependence rests in cutting them out with a knife.

For an orchard of one hundred trees, of only six varieties, the following would be a good selection:

Porter	10	Baldwin	20
Coggswell's Pearmain	10	Greening	20
Golden Sweet	20	Roxbury Russet	20

For twelve varieties—

Sweet Bough	5	Golden Sweet	20
Early Harvest	5	Rhode Island Greening	10
Fameuse	5	Baldwin	10
Porter	5	Roxbury Russet	10
Coggswell's Pearmain	5	Peck's Pleasant	5
Hurlburt	10	Excel	10

Divided among twenty varieties—

Early Bough	2	Gilliflower	3
Early Harvest	2	Spitzenberg	3
Early Strawberry	1	Peck's Pleasant	3
Red Astrachan	1	Excel	5
Fameuse	3	Coggswell's Pearmain	5
Porter	3	Hurlburt	10
Seek-no-Further	2	Greening	10
Fall Pippin	2	Baldwin	10
Winter Belle-fleur	2	Roxbury Russet	10
Swaar	3	Golden Sweet	20

For one thousand trees designed for market, I would have less varieties, say,

Porter	50	Rhode Island Greening	200
Excel	50	Roxbury Russet	200
Hurlburt	50	Baldwin	200
Coggswell's Pearmain	50	Golden Sweet	200

These are all thrifty growers and great bearers, and the fruit is both handsome and good. There are many varieties cultivated in this section under the name of "Golden Sweet," ripening in succession after the Sweet Bough, until midwinter. The trees are thrifty and bear when most other varieties fail. The fruit, when mature, is large, yellow, rich, and very sweet. Any favorite sweet apple may be substituted in our list. In an orchard of two hundred trees I have planted the Baldwin, Greening, Roxbury Russet, Coggswell's Pearmain, Blue Pearmain, Northern Spy, Peck's Pleasant, Swaar, McLellan, Chandler, Gravenstein, White, Seek-no-Further, Esten, Ramsdell's Sweet, Shepherd's Sweet, Danvers Winter Sweet, Ladies' Sweeting, and Waterman's Sweet, setting out the largest number of the first named in the list.

PEARS

I would prefer on the pear stock, the following six varieties for family use: Dearborn's Seedling, Bartlett, Flemish Beauty, Louise Bonne de Jersey, Seckel, and Winter Nelis. I have recently planted a pear orchard of sixty trees, mostly of the following varieties: Vicar of Winkfield, Winter Nelis, Seckel, Urbaniste, Bartlett, Belle Lucrative, and Flemish Beauty. In planting an orchard of one hundred or one thousand trees for market, I should add the Lawrence to this list, preferring a large proportion of winter varieties.

My experience in other varieties is too limited to warrant any opinion, as also in the culture of the pear on the quince stock.

PEACHES.

I can say but little of peaches. Seedling Blood peaches prove hardy and healthy, and bear regularly. We have one tree nearly

twenty years old, still healthy. With other varieties, I have had but little success.

GRAPES.

Isabellas generally ripen well, especially if not allowed to over-bear. I have recently planted the new varieties which promise well, namely, Rebecca, Delaware, Diana, Hartford Prolific, To-Kalon, Herbemont, and Concord. In a vinery, we succeed with the best foreign varieties. We allow a larger growth of foliage than is recommended, and to this and the pure air, we attribute the fact that our grapes always color well, have a thin delicate skin, and are of excellent flavor.

GOOSEBERRIES.

The English gooseberries can only be preserved here from mildew by the liberal application of salt to the soil, and of whale-oil soap-suds to the leaves and fruit.

The Houghton Seedling bears abundantly; the berries are of good size, and the flavor is preferred to foreign sorts.

CHERRIES.

The severe winters, or some other cause, have, within three years, destroyed most of the old cherry trees in this section. The young trees have mostly survived; but the bark has often burst, and the young shoots sprung up among the limbs, often growing several feet late in the season, and partially dying in the winter. This year, the fruit was abundant and superior.

PLUMS.

The "black-knot" destroys all neglected trees. We do not allow any on our premises, but cut off on the first appearance. Protect from the curculio by showering with a mixture of whale-oil soap-suds, manure water, sulphur, ashes, and salt. It must not be strong enough to affect the foliage. Our principle varieties are the Yellow and Imperial Gage.

QUINCES,

Formerly did well, but the borer is now destroying them all.

My experience in apricots, nectarines, strawberries, raspberries, and blackberries has been too limited to be of any consideration. They may all be raised with proper care.

GEORGIA.

FROM J. VAN BUREN, OF CLARKVILLE.

APPLES.

For an orchard of one hundred trees—I would recommend the following, comprising seventeen varieties:

Red June (summer)	2	Berry (winter)	6
Cane Creek Sweet (summer)	2	Buff (winter)	3
Julien (summer)	2	Camak's Winter Sweet	10
Sweet Paradise (summer)	2	Cullasaga (winter)	5
Bachelor (autumn)	8	Cullawkee	3
Disharoon (autumn)	4	Equinetley (winter)	20
Chistalee (autumn, for cooking)	2	Hoover (winter)	10
Rome Beauty (autumn)	2	Maverick's Sweet (winter)	10
		Nickajack (winter)	9

Best twelve varieties for an orchard of one hundred trees.

Red June (summer)	2	Nickajack (winter)	10
Julien (summer)	2	Equinetley (winter)	20
Cane Creek Sweet (summer)	2	Camak's Winter Sweet	20
Bachelor (autumn)	10	Cullasaga (winter)	10
Disharoon (autumn)	5	Junaluskee (winter)	10
Rome Beauty (autumn)	5	Winter Queen (winter)	4

Best six varieties for an orchard of one hundred trees—

Julien	6	Equinetely	26
Bachelor	6	Camak's Sweet	26
Nickajack	26	Hoover	9

PEARS.

Best twelve varieties on pear stocks for an orchard of one hundred trees:

Madeleine	4	Paradise d'Automne	10
St. Ghislain	4	Seckel	10
Bartlett	4	Sterling	10
Beurré Clairgeau	10	Van Assche	10
Belle Lucrative	10	Winter Nelis	10
Beurré d'Anjou	10	Easter Beurré	8

FROM WILLIAM N. WHITE, OF ATHENS.

APPLES.

Best six varieties for a family orchard of one hundred trees, to furnish a succession:

Red June	3	American Summer Pearmain	3
Horse	4	Bachelor	10
Meigs	30	Nickajack	5

Best twelve varieties for an orchard of one hundred trees—

Early Harvest (summer)	2	Bachelor (autumn)	10
Red June (summer)	2	Nickajack (winter)	15
American Summer Pearmain	3	Equinetley (winter)	15
Julien (summer)	2	Oconee Greening (winter)	10
Horse (summer)	4	Green Crank (winter)	15
Meigs (autumn)	12	Shockley (winter)	10

Best twenty varieties for an orchard of one hundred trees:

May (summer)	1	Horse (summer)	3
Early Harvest (summer)	2	Gravenstein (summer)	5
Red June (summer)	2	Meigs (autumn)	10
American Summer Pearmain	3	Taunton (autumn)	6
Julien (summer)	2	Bachelor (autumn)	6
Mangum (winter)	9	Green Crank (winter)	9
Maverick Sweet (winter)	4	Berry (winter)	4
Nickajack (winter)	10	Camak's Winter Sweet	5
Equinetley (winter)	9	Bradford's Best	4
Oconee Greening (winter)	4	Shockley	6

The following selection of varieties for an orchard of one thousand trees is adapted for the lower part of the State near railroads, to be shipped to northern markets:

Early Harvest	400	American Summer Pearmain	200
Red June	400		

In the upper part of the State the following would be a good list—

Camak's Sweet	100	Shockley	200
Green Crank	200	Equinetley	200
Mangum	50	Nickajack	250

PEARS.

Best six varieties on pear stocks for a succession:

Doyenné d'Été,
Beurré Bosc,
Bartlett,
Winter Nelis,
Seckel,
Beurré Suis d'Hiver (nouveau.)

Best twelve varieties for a succession, add

Bloodgood,
Sterling,
Belle Lucrative,
White Doyenné,
Lawrence,
Compte de Flanders.

Best six varieties on quince stocks—

Doyenné d'Été,
Duchesse de Berri d'Été,
Duchesse d'Angoulême,
Louise Bonne de Jersey
Glout Morceau,
Easter Beurré.

For the best twelve varieties, add

Beurré Diel,
Rostiezer,
Soldat Laboureur
Lawrence,
White Doyenné,
Belle Épine Damon.

In this climate, if the quince stock is set entirely in the earth, it is sure to perish, as the shrub throws out its roots near the surface. I have lost more pear trees on quince stocks by the root decaying up to the point of junction with the graft, than I have ever lost by blight either on pear or quince.

In an orchard of one hundred or one thousand trees, with the above, I should also include, Buffum, Manning's Elizabeth, Camak's, Neighbors, Van Assche, Beurré Clairgeau, Beurré d'Anjou, Henry IV., Delices d'Hardenpont Belgic, Columbia, Tyson, Heathcot, Kirtland, Flemish Beauty, Rivers' Winter Beurré, Beurré Langelier, and Sheldon, at least, and several others of which I am not satisfied that I have the true names.

For market, I would confine myself to Doyenné d'Eté, Duchesse de Berri d'Été, Sterling, Bartlett, White Doyenné, and Flemish Beauty. With these varieties, the Northern markets could be fully supplied during the months of June, July and a part of August, from this State and South Carclina.

PEACHES.

The best six kinds are below, but no six nor twelve kinds can keep up a succession in this climate from the 20th of June, until the 20th of November, during which we have peaches:

Early Tillotson,	Large Early York,
Stump the World,	La Grange,
Heath Cling,	Bough.

For the best twelve varieties, add to the above—

Serrate Ispahan,	Hull's Athenian,
Washington Cling,	Washington Rareripe, (Parsons,)
Chinese Cling,	Edwards' Late White.

A complete collection would require in addition to the above, of Clings—

Georgia Cling,	Tippecanoe,
Large White Cling,	Donohue,
Oldmixon Cling,	Horton's Delicious.
Blonton,	

Of freestone varieties—

Serrate Early York,	Druid Hill,
Van Zandt's Superb,	Smock, (free,)
Fay's Early Ann,	Montgomery's Late,
Coolidge's Favorite,	Harker's Seedling,
Crawford's Early,	Camak's Serrate,
Crawford's Late	Lady Parham,
Late Admirable	Baldwin's Late.

With much less than the above number of varieties, a constant succession could hardly be kept up for five months.

For one hundred or one thousand trees for market purposes, I would confine myself to Early Tillotson, Fay's Early Ann, Columbus June, Early Chelmsford, and Crawford's Early, and ship all the fruit to the Northern cities.

For drying, the best fruit tried here is the Heath Cling.

ILLINOIS.

FROM VERRY ALDRICH, OF ARISPE.

APPLES.

Best six varieties for an orchard of one hundred trees:

Red June (summer)	10	Dominie (winter)	20
Summer Pennock	10	Wagner (winter)	20
Snow (fall)	15	Willow-Twig	25

Best twelve varieties for an orchard of one hundred trees:

Red June (summer)	10	Dominie (winter)	15
Sops of Wine (summer)	5	Wagner (winter)	15
Summer Pennock	10	Willow-Twig	15
Tompkins (fall)	5	White Belle-fleur (winter)	5
Snow (fall)	5	Yellow Belle-fleur (winter)	5
Cloth of Gold (fall)	5	New York Pippin (winter)	5

Best twenty varieties for an orchard of one hundred trees—

Red June (summer)	5	Sweet Wine (fall)	2
Sops of Wine (summer)	2	Cloth of Gold (fall)	2
Summer Pennock	5	Dominie (winter)	10
Red Astrachan (summer)	3	Wagner (winter)	10
Cooper's Early White (summer)	2	Willow-Twig, (winter)	10
Leicester Sweeting (summer)	2	White Belle-fleur (winter)	2
Tompkins (fall)	3	Yellow Belle-fleur (winter)	2
Snow (fall)	5	New York Pippin (winter)	10
Fall Wine	2	Red Seek-no-Further (winter)	10
Hawley (fall)	3	Swaar (winter)	10

Best varieties for an orchard of one thousand trees for market, which will depend a good deal upon how near and large the market is—

Red June (summer)	200	Wagner (winter)	150
Summer Pennock	100	Willow-Twig (keeps long)	200
Snow (fall)	50	New York Pippin (keeps long)	200
Dominie (winter)	100		

PEARS.

We have not had experience enough yet, nor varieties sufficient to make out a list. Among what I have, the Onondaga, Flemish Beauty, White Doyenné, Louise Bonne de Jersey, Dearborn's Seedling, Buf-

fum, Heathcot and Stevens Genesee, all promise well, both as standards and dwarfs, Onondaga excepted.

MASSACHUSETTS.

FROM EBEN WIGHT, OF DEDHAM.

PEARS.

Beurré Hardi.—The favorable opinion heretofore expressed of this variety holds good.

Buffum.—Though not strictly first in quality, yet, altogether, it is one of the most desirable, and worthy of general cultivation. Considering its growth, hardiness, &c., it might in a measure act as a barrier in the place of evergreens, planted as screens to protect fruit trees in blossom. A crop of about 3 barrels is given for trees planted about fifteen years.

Doyenné Boussoch.—This is a large pear, and when picked early, cannot fail of giving satisfaction. It is a magnificent grower and very hardy.

Beurré Superfin.—Of the first quality, not yet a prolific bearer, but cannot well be dispensed with. Equal to the old Brown Beurré in its best condition.

Abbott.—A good grower, prolific bearer, very handsome, and always proves excellent. Season, October.

Louise Bonne de Jersey.—This has proved good. It is one of the most productive and best paying varieties.

Shepherd.—A seedling raised in Dorchester, giving promise of being one of our best varieties for the season—ripening the first of October—size large.

Sterling.—This has proved uniformly handsome, and a good variety for market—coming early in September and is productive.

Charles Van Hooghten.—This is a very large pear, an abundant bearer, and must pay well as a market fruit. Season, September—quality, medium.

Beurré d'Anjou.—On all sides, the same good opinion is expressed as heretofore.

Madame Eliza.—Here we have another which promises well for the market. A large fruit, and very prolific. Ripening in December.

Emile d'Heyst.—Continues to prove fine and fair, resembling in flavor and quality the Beurré d'Aremberg, and of similar texture; a much better grower. Season, November to December.

St. Michel Archange.—Succeeds well, both on quince and on its own root, and proves fine.

Henri Bivort.—Is a great bearer, sweet and high flavored; but is of short duration. Ripens early in September.

Urbaniste.—This very desirable pear does better on the quince than on its own root.

Dallas.—On the pear stock, is some fifteen years in coming into

bearing, though for hardness, it rivals the oak; a handsome, well-flavored fruit, ripening in November.

Meriam.—One of the most attractive varieties of its season. Ripens about the 20th of September.

Theodore Van Mons.—Proves well, forming a fine pyramidal tree. The fruit rich, and uniformly good. Season, October.

Nouveau Poiteau.—Makes a very handsome, hardy and thrifty tree; fruit large and abundant, keeping till November, but rather too buttery.

Doyenné Dillen.—A large winter variety of high flavor, ripening in December. In warm rich soil, it gives promise of being valuable.

Conseilleur de la Cour.—A new pear of large size, excellent quality—a hardy tree, promising to be a compeer of the Beurré d'Anjou, but more vinous and spirited in flavor. Ripens in October and November.

Antoinette.—Makes a handsome pyramidal tree, promising well; fruit, handsome and of medium size. Season, October and November.

Gros Rousselet d'Août.—Handsome, and as an early sort, may prove desirable. Season, last of August.

Beurré Kennes.—Is a superior pear, a great bearer, hanging in clusters of a handsome russet color—size, medium. Season, October.

Beurré Nantais.—In quality is very fine, and is equally desirable on the quince as its own root. Season, October.

Howell.—Still holds its place foremost among the many, always fine and keeping well. Season, November.

Sheldon.—This and the following three varieties pay well for the market:

Swan's Orange.—Proves a good bearer, is handsome and hardy—a fine market fruit.

Adams.—For general cultivation, repays handsomely.

Boston.—Pays well.

The following named varieties were decided on for pears on their own roots, namely, twelve varieties:

Bartlett,
Urbaniste,
Vicar of Winkfield,
Buffum,
Beurré d'Anjou,
Lawrence,
Rostiezer,
Meriam,
Flemish Beauty,
Belle Lucrative,
Doyenné Boussoch,
Swan's Orange.

On quince, six varieties—

Louise Bonne de Jersey,
Urbaniste,
Duchesse d'Angoulême,
Vicar of Winkfield,
Beurré d'Anjou,
Glout Morceau.

APPLES.

For six varieties:

Williams,
Early Bough,
Gravenstein,
Fameuse,
Hubbardston,
Baldwin.

For twelve varieties, add

Red Astrachan,	Roxbury Russet,
Rhode Island Greening,	Smith's Cider,
Ladies' Sweet,	Talman's Sweet.

GRAPES.

(Out-door culture.)

The *Delaware* has been found to increase in the size of its fruit as the vines become more fully matured, and merits the first place for out-door culture.

The *Diana* can always be relied upon, as ripening seasonably for gathering before our early frosts.

The *Concord*, is well spoken of for the Middle States, where it ripens better than with us. It seems to be acknowledged on all sides that it matures where the Isabella fails.

The *Rebecca*, in the hands of some, has proved hardy enough to withstand our winters without protection, while with others it has been killed to the ground.

The *Hartford Prolific*, while a few condemn it for its quality, all agree that it ripens seasonably for the North, and before the approach of frosts. Some of our cultivators, who once discarded it, are now favorably impressed with its early maturity and adaptation to our cold.

STRAWBERRIES.

The only varieties cultivated to any extent are the Early Scarlet, Hovey, Boston, Pine, Jenny Lind, and Brighton Pine; these have uniformly done well.

MICHIGAN.

FROM D. K. UNDERWOOD, OF ADRIAN.

APPLES.

Best six varieties for an orchard of one hundred trees for family use:

Early Harvest	10	Belmont	15
Late Strawberry	10	Yellow Belle-fleur	30
Gravenstein	15	Esopus Spitzenberg	20

Best twelve varieties for an orchard of one hundred trees—

Early Harvest	6	Belmont	10
American Summer Pearmain	6	Ladies' Sweeting	6

Late Strawberry	6	Yellow Belle-fleur	20
Gravenstein	8	Swaar	6
Fall Pippin	6	Esopus Spitzenberg	12
Rambo	6	Northern Spy	8

Best twenty varieties for an orchard of one hundred trees—

Early Harvest	6	Ladies' Sweeting	6
American Summer Pearmain	3	Belmont	6
Red Astrachan	3	Rhode Island Greening	4
Bough	3	Yellow Belle-fleur	12
Summer Queen	3	Esopus Spitzenberg	6
Late Strawberry	4	Swaar	6
Gravenstein	5	Jonathan	4
Fall Pippin	5	Hubbardston Nonesuch	4
Fameuse	4	Roxbury Russet	6
Rambo	4	Northern Spy	6

Best varieties for an orchard of one thousand trees, for market—

Early Harvest	50	Belmont	75
Red Astrachan	50	Vandevere	50
Early Strawberry	25	Baldwin	25
American Summer Pearmain	25	Red Canada	75
Early Joe	25	Rhode Island Greening	75
Late Strawberry	25	Jonathan	50
Gravenstein	50	Yellow Belle-fleur	75
Fameuse	50	Hubbardston Nonsuch	25
Porter	25	Westfield Seek-no-Further	25
Rambo	50	Roxbury Russet	50
Talman's Sweet	25	Northern Spy	50
Ladies' Sweet	25		

PEARS.

Best six varieties for a pear orchard for family use:

Bartlett, White Doyenné,
Flemish Beauty, Seckel,
Belle Lucrative, Winter Nelis.

Best twelve varieties for family use—

Bloodgood, Belle Lucrative,
Tyson, White Doyenné,
Dearborn's Seedling, Sheldon,
Bartlett, Seckel,
Flemish Beauty, Lawrence,
Beurré d'Anjou, Winter Nelis.

Best six on quince stocks—

Tyson, Duchesse d'Angoulême,
Louise Bonne de Jersey, Beurré Diel,
Belle Lucrative, Easter Beurré.

Best twelve on quince stocks—

Tyson,
Rostiezer,
Belle Lucrative,
Louise Bonne de Jersey,
Duchesse d'Angoulême,
Stevens' Genesee,
White Doyenné,
Urbaniste,
Beurré Diel,
Glout Morceau,
Vicar of Winkfield,
Easter Beurré.

Best varieties on pear stock for an orchard of one hundred trees—

Madeline	3	Belle Lucrative	5
Bloodgood	3	Oswego Beurré	5
Dearborn's Seedling	3	Sheldon	5
Tyson	3	Buffum	5
Rostiezer	3	Seckel	10
Bartlett	10	Lawrence	5
Flemish Beauty	10	Winter Nelis	5
Beurré d'Anjou	5	Beurré d'Aremberg	5
White Doyenné	15		

Best on quince stocks for an orchard of one hundred trees—

Tyson	5	Duchesse d'Angoulême	20
Rostiezer	5	Glout Morceau	5
Belle Lucrative	10	Beurré Diel	10
Stevens Genesee	5	Vicar of Winkfield	5
Louise Bonne de Jersey	25	Easter Beurré	10

PEACHES.

Best six varieties for a family orchard:

Early York Serrate,
Coolidge's Favorite,
Crawford's Early,
Grosse Mignonne.
Old Mixon, (free,)
Crawford's Late.

Best twelve varieties for a family orchard—

Early York Serrate,
Early York, (large,)
Coolidge's Favorite,
Crawford's Early,
Jacques Rareripe,
Grosse Mignonne,
George IV.,
Large Red Rareripe,
White Imperial,
Old Mixon, (free.)
Bergen's Yellow,
Crawford's Late.

Best varieties for an orchard of one hundred trees—

Crawford's Early	20	Old Mixon, (free,)	10
Early York	10	Large Red Rareripe	10
Coolidge's Favorite	10	White Imperial	5
Jacques Rareripe	5	Crawford's Late	20
Grosse Mignonne	10		

NEW JERSEY.

FROM WILLIAM REID, OF ELIZABETHTOWN.

APPLES.

Apples, so long celebrated for their superior quality in this part of the State, have been generally, for the last four or five years, unsound, from the effects of the worm. This season, in some sections, they are more promising, but the crop will be light. It does not seem to be necessary to discard those varieties that have done well, although their fruit has not been fair, as the trees are still as vigorous as ever. The great object is to discover a remedy for these depredations. The only one yet known is to gather up the fallen fruit, and feed it to swine, or to let them run in the orchard. From this cause, no valuable information has been attained in regard to new varieties for the last few years. The following early varieties are among the most valuable for this section:

Early Harvest, for the first of the season, has no superior, being one of the best cooking apples known, also excellent for table use. It always commands a good price, frequently from 75 cents to $1 per bushel.

Red Juneating, or *Strawberry*, is also cultivated, but does not, in this section, produce such fine specimens as the Yellow Harvest, and is not so valuable for the orchard.

Summer Hagloe.—This variety is now in general cultivation through many parts of the State. It succeeds the Yellow Harvest, a very abundant bearer, of a large size, an excellent market apple, and one of the best cooking apples of the season.

Keswick Codling, another excellent early cooking apple, an abundant bearer, valuable for use through the months of August and September. Maiden's Blush, Nyack, or Summer Pippin, Orange Pippin, Drap d'Or, Sweet Bough, Red Astrachan, and Summer Rose are all valuable early varieties.

FALL AND WINTER APPLES.

Fall Pippin, Gravenstein, Porter, Rhode Island Greening, Hubbardston's Nonsuch, Seek-no-Further, Rambo, Monmouth Pippin, Baldwin, Yellow Belle-fleur, Roxbury Russet, Newtown Pippin, and Smith's Cider are among the best in cultivation.

Sweet Apples for Fall and Winter.—Jersey Sweet, Lymans' Pumpkin, Danvers, Talman and Hartford Sweet; and for cider, Canfield, and Harrison.

Best six varieties for an orchard of one hundred trees:

Yellow Harvest	5	Rhode Island Greening	25
Maiden's Blush	10	Baldwin	25
Fall Pippin	10	Roxbury Russet	25

Best twelve varieties—

Yellow Harvest	5	Baldwin	10
Maiden's Blush	8	Yellow Belle-fleur	10
Hubbardston Nonsuch	8	Monmouth Pippin	10
Sweet Bough	5	Esopus Spitzenberg	10
Fall Pippin	8	Newtown Pippin	8
Rhode Island Greening	10	Roxbury Russet	8

Best twenty varieties—

Yellow Harvest	3	Monmouth Pippin	8
Sweet Bough	2	Yellow Belle-fleur	5
Summer Hagloe	3	Newtown Pippin	5
Maiden's Blush	5	Talman Sweet	5
Fall Pippin	5	Dominie	5
Gravenstein	5	Seek-no-Further (Westfield)	5
Jersey Sweet	2	Esopus Spitzenberg	5
Hubbardston Nonsuch	5	Roman Stem	5
Rhode Island Greening	10	Roxbury Russet	5
Baldwin	8	Lady Apple	4

Varieties for an orchard of one thousand trees—

Yellow Harvest	30	Esopus Spitzenberg	50
Sweet Bough	25	Newtown Pippin	50
Maiden's Blush	50	Monmouth Pippin	75
Fall Pippin	50	Roxbury Russet	75
Gravenstein	50	Dominie	50
Jersey Sweet	25	Lady Apple	25
Hubbardston Nonsuch	50	Smith's Cider	50
Rhode Island Greening	100	Seek-no-Further	50
Baldwin	60	Roman Stem	25
Yellow Belle-fleur	60	Wine	25
Talman Sweet	25		

PEARS.

The length of the season, from the middle of July to the first of May, that pears may be had for dessert and cooking purposes, and their great certainty of bearing, with very few exceptions, make them one of the most valuable fruits in cultivation. The following varieties are considered well adapted and of the best quality for this section of country:

EARLY SUMMER PEARS.

Madeleine.—This variety still retains its superiority as the first good pear of the season, improving in quality as the tree grows old. This remark applies to all pears cultivated on the pear root, although they frequently bear, when five or six years planted, tolerable crops, yet seldom attain perfection under ten or twelve years. When worked on

the quince, however, five or six years will generally enable a person to judge of their quality.

Beurré Giffard.—This fine early pear, for the past two summers, has produced good crops, ripe about the first of August, succeeding Madeeline, and promises to be one of the best at this season. It is well worthy of cultivation.

Doyenné d' Été.—This beautiful early pear has just come into bearing here, and promises to be an acquisition to our list of summer varieties. When gathered from the tree and ripened in the house, it is of good quality, ripe about the first of August, and grows well on either pear or quince stocks.

Beurré Benoist.—This for the past two or three years has borne well, and promises to be worthy of cultivation, producing fair, smooth specimens; ripe the first week in August. Cultivated on the quince.

Dearborn's Seedling, *Bloodgood*, *Rostiezer*, and *Tyson*—Are all of good quality and succeed well; the two former are best on the pear root. Rostiezer grows vigorously on either pear or quince. Tyson seems to be rather slow in coming into bearing on heavy soils; but this, we believe, is not the case on light soils.

English Jargonelle and *Windsor*—Are two of the best early pears for cooking purposes, being vigorous and producing large crops.

AUTUMN PEARS.

Bartlett.—For the first early autumn pear, we have nothing here to equal this, taking into consideration its large size and productiveness, seldom or never failing, even in unfavorable seasons, to bear good crops, making it one of the most valuable varieties yet introduced for general cultivation, ripening at this time of the year. The demand, for the last ten years, has been greater than for any other kind; a sure evidence of its valuable properties. Though generally cultivated on the pear stock, this variety may be successfully grown on the quince, thus often producing the finest specimens. It is necessary, however, with regard to this, as well as all others on the quince, to plant deep enough to cover the stock 3 inches, without which, it will seldom prosper.

Beurré d' Amanlis—For the past two or three years, is more favorably thought of than formerly, having borne fine crops of large fruit, and, some seasons, of excellent quality. Although one of the kinds which do not keep so long as the Bartlett and some others after gathering, yet it is a very good orchard pear, making a large, vigorous tree. Grows well either on pear or quince.

Heathcot—In this locality, grows vigorously, and makes an excellent orchard pear—very regular bearer; fruit frequently equal to a fine White Doyenné; comes into use after the Bartlett. This variety is best on the pear stock.

Andrews.—Few better pears are grown than the Andrews, always fair and smooth, of uniform size; makes a very good orchard tree. Succeeds well in this neighborhood.

Duchesse d' Angoulême.—For the last few years, this pear has been

extensively planted in this section for market. With the exception of the Bartlett, we have no pear more sought after, commanding in our markets the highest price, its extraordinary size and good keeping qualities adding greatly to its value; continuing in season frequently six weeks after gathering. This variety is decidedly best on the quince stock, in heavy soils, but on light soils, it produces well on the pear.

Doyenné Boussock—Although not yet in general cultivation, ought to be in every collection of fruit; always fair and large, of fine uniform size, frequently as large as the Bartlett; one of our best pears; grows on either pear or quince stocks, making a vigorous tree.

Flemish Beauty—is another pear which is grown to some extent; sells well in our markets, and at present is very popular, ripening after the Bartlett, thus becoming more valuable for a market fruit. The quality of this pear, though liable to rot at the core, some seasons, is generally considered good. It may be planted with safety either on the pear or quince; although rather slow of growth on the latter for a few years, it will in time make a vigorous tree.

Belle Lucrative—Still retains its popularity as one of our best autumn pears, although not quite so large as those previously mentioned, but of a very fair size when under good cultivation, and may be classed as one of the best; may be grown on either pear or quince stocks.

Louise Bonne de Jersey.—This pear, on light soils, produces remarkably fine specimens, bears abundantly, and is one of the most valuable varieties; grows either on pear or quince; on heavy soils, it is best cultivated on the latter.

Beurré Bosc—Coming into use after the earlier autumn pears are gone, is one of the most valuable we have in cultivation, keeping remarkably well for several weeks after gathering, and of excellent quality, well adapted for marketing. Although trees of this variety are rather slow of growth, when young, it is perfectly hardy, and makes with age a fine orchard tree; grows only on the pear stock.

Urbaniste is one of those varieties which does not come into bearing very early, but is certainly one of the best orchard trees grown, being of great vigor and hardiness, one of our most valuable varieties for general cultivation. On the quince stock, it bears sooner, and makes also a fine tree, but rather slow of growth the first few years.

Beurré d'Anjou has been for the last two or three years of the very best quality, and will no doubt prove one of our most valuable late autumn pears. Tree hardy and vigorous, grows well on either pear or quince stocks.

All of the above-named autumn pears may be considered among the best, being suitable either for orchard cultivation or for the amateur; are all of the best quality and vigorous growth. The following kinds of autumn pears have also been in bearing, and many of them promise to be well adapted to general cultivation: Henkill, Cabot, St. Ghislain, Washington, Ananas d'Été, Stevens Genesee, Beurré Montgeron, Beurré St. Nicholas, Kingsessing, Chancellor, Kirtland Beurré, Brandywine, Bonne d'Ézée, Buffum, Cushing, Fulton, and Henry IV.

WINTER PEARS.

Beurré Diel, one of our early winter pears, ripe about the first of December, is considered one of the best we have here, of a large size and of the best quality. It grows well either on pear or quince.

Vicar of Winkfield.—This pear is very productive and is planted extensively for marketing, one of the largest and finest looking grown; not quite so melting as some other kinds, but occasionally of very good quality; one of the most profitable in cultivation, and grows well on pear or quince stock.

Winter Nelis, one of the best winter pears, ripening in December. This variety will not be so profitable for orchard culture as those of a larger size, but ought to be in every collection.

Glout Morceau, one of our best winter pears. When young, it is liable sometimes to produce imperfectly-shaped fruit, but when it once comes into bearing freely, the specimens are fine, perfectly melting to the core—grows well either on pear or quince stock.

Bergamotte d' Esperen, has been for the two last seasons excellent, keeping until March; one of our best late pears, ripening in the house without any loss; grows well either on pear or quince; on heavy soils produces fine specimens on the latter.

Doyenné d' Alençon and *Easter Beurré* are two of the latest keeping pears, will keep sometimes until May; two of the best for this season, and both succeed well in this part of the State.

For the sake of abridging these remarks, many pears of the very best quality have been omitted, yet they should be in every amateur's collection. There are also many other kinds which have only only borne fruit for the first or second time, which promise well, and some of them will no doubt be added to our lists for general cultivation on further trial.

Best six varieties on the pear stock:

Beurré Giffard.	Beurré d'Anjou.
Bartlett.	Winter Nelis.
Seckel.	Glout Morceau.

Best twelve varieties—

Madeleine.	Belle Lucrative.
Beurré Giffard.	St. Ghislain.
Bartlett.	Seckel.
Beurré d'Anjou.	Winter Nelis.
Vicar of Winkfield.	Glout Morceau.
Beurré Diel.	Easter Beurré.

Best six varieties on the quince—

Rostiezer.	Beurré d'Anjou.
Belle Lucrative.	Beurré Diel.
Duchesse d'Angoulême.	Glout Morceau.
Louise Bonne de Jersey.	

Best twelve varieties on the quince—

Doyenné d'Été.	Vicar of Winkfield.
Rostiezer.	Beurré Diel.
Belle Lucrative.	Glout Morceau.
Duchesse d'Angoulême.	Bergamotte d'Esperen.
Louise Bonne de Jersey.	Doyenné d'Alençon.
Beurré d'Anjou.	Easter Beurré.

For an orchard of one hundred trees on the quince stocks—

Doyenné d'Été	3	Louise Bonne de Jersey	10
Rostiezer	3	Urbaniste	5
Bartlett	3	Beurré d'Anjou	10
Duchesse d'Angoulême	5	Vicar of Winkfield	5
Bonne d'Ézée	2	Beurré Diel	5
Belle Lucrative	5	Columbia	3
Beurré Superfin	2	Glout Morceau	5
Andrews	2	Beurré Langelier	3
Stevens Genesee	2	Bergamotte d'Esperen	3
Henry IV	2	Doyenné d'Alençon	2
Doyenné Boussock	3	Easter Beurré	1
Kirtland Beurré	2	Catillac	2
Buffum	2	Uvedale's St. Germaine	2
Kingsessing	2	Epine du Mas	2
Flemish Beauty	2		

For an orchard of one thousand trees on the quince stock—

Doyenné d'Été	10	Louise Bonne de Jersey	100
Rostiezer	10	Urbaniste	50
Bartlett	25	Beurré d'Anjou	50
Duchesse d'Angoulême	100	Vicar of Winkfield	75
Bonne d'Ézée	25	Beurré Diel	65
Belle Lucrative	25	Columbia	50
Beurré Superfin	25	Glout Morceau	75
Andrews	25	Beurré Langelier	25
Stevens Genesee	25	Bergamotte d'Esperen	30
Henry IV	5	Doyenné d'Alençon	25
Doyenné Boussock	25	Easter Beurré	10
Kirtland Beurré	10	Catillac	10
Buffum	25	Uvedale's St. Germain	10
Kingsessing	10	Epine du Mas	20
Flemish Beauty	25		

For an orchard of one hundred trees on the pear stocks—

Madeleine	1	Urbaniste	5
Beurré Giffard	1	Beurré Clairgeau	3
Bloodgood	1	Sheldon	5
Dearborn's Seedling	1	Vicar of Winkfield	5
Rostiezer	1	Beurré Diel	5
Tyson	1	Winter Nelis	5
Bartlett	5	Lawrence	2

Heathcot	2	Glout Morceau	5
Belle Lucrative	5	Bergamotte d'Esperen	3
St. Ghislain	2	Doyenné d'Alençon	5
Flemish Beauty	5	Easter Beurré	2
Beurré Bosc	5	Windsor (for cooking)	2
Andrews	3	Jargonelle, "	1
Louise Bonne de Jersey	5	Hericart, "	1
Seckel	5	Hessel, "	1
Duchesse d'Angoulême	2	Uvedale's St. Germain	1
Beurré d'Anjou	5		

For an orchard of one thousand trees on the pear stock—

Madeleine	5	Urbaniste	50
Beurré Giffard	10	Beurré Clairgeau	25
Bloodgood	5	Sheldon	30
Dearborn's Seedling	5	Vicar of Winkfield	50
Rostiezer	5	Beurré Diel	50
Tyson	5	Winter Nelis	30
Bartlett	100	Lawrence	30
Heathcot	25	Glout Morceau	50
Belle Lucrative	25	Bergamotte d'Esperen	50
St. Ghislain	20	Doyenné d'Alençon	50
Flemish Beauty	50	Columbia	25
Beurré Bosc	50	Easter Beurré	50
Andrews	20	Windsor	5
Louise Bonne de Jersey	50	Jargonelle	5
Seckel	50	Hericart	5
Duchesse d'Angoulême	10	Hessel	5
Beurré d'Anjou	50	Uvedale's St. Germain	5

PEACHES.

Peaches for the two past seasons have been of inferior quality. The trees which were in a bearing state have nearly all been injured by the severity of the winters. The young orchards are again promising, and will in the course of another year be in a good bearing condition.

Best six varieties for a family orchard:

Early Newington,
Early Crawford's Melocoton,
Late Crawford's Melocoton,
George IV.
Oldmixon Freestone,
Morris White.

Best twelve varieties for an orchard—

Early Newington,
Early York,
Crawford's Early Melocoton,
Crawford's Late Melocoton,
George IV.
Morris White,
Oldmixon Freestone,
Oldmixon Cling,
Noblesse,
Grosse Mignonne,
Heath Late Cling.

QUINCES.

The crop this season is very promising, and will be one of the best that has been produced here for some years. To have fine trees, budded plants are the best, being free from sprouts and superior to those grown from cuttings; they are also, when grown with single stems, much easier cultivated and kept clean. To have fine specimens of quinces, they should be well cultivated, in good ground, and not in wet and unprepared places, as is generally the case. The Pear, Portugal, and Apple-shaped varieties are cultivated, but the latter is generally preferred.

APRICOTS.

This fruit, when trained against buildings and on a trellis, sometimes produces good crops, but is very uncertain when cultivated as a standard in exposed situations.

PLUMS.

We have had no encouragement since the last report, to speak any more favorably of the cultivation of this fine fruit in our section; and, owing to the curculio, it seems almost useless to attempt its cultivation here.

NECTARINES.

Nectarines can only be cultivated with any certainty under glass, the curculio otherwise invariably destroying them.

GRAPES.

The great attention now being paid to this most valuable fruit has been the means of bringing into cultivation many new varieties, and some of them promise excellence. Ere long, we are likely to have, in place of some ten or twelve kinds, as many as are to be found in European collections, and no doubt varieties will be found among them suitable for all the different soils and localities in the United States, so that every large city and town will be as abundantly supplied with fine grapes as they are with apples, peaches, &c. This will require some time and experience to select those kinds best adapted to certain localities.

Isabella and *Catawba*—Are the only varieties yet in general cultivation here; both of these succeed well in favorable seasons, when the foliage keeps free from mildew, which has been rather troublesome for the last two or three years. A deep soil, well drained and not over rich, is considered the best for grape-culture, not being liable to produce such rank growth, in which case the mildew is more

apt to attack the vine. Whatever system may be best for training, the wood should be extended with ample room, the young shoots well selected, and all superfluous shoots and fruit rubbed off in the first dressing; afterward, it will be safer to let them retain nearly all their foliage through the summer; stopping the young shoots, a few joints above the fruit, will be allthey require. When close summer-pruning is practised with frequent pinching of the young growth, it makes the leaves very large, but frequently these will rust and drop long before the fruit arrives at maturity, leaving nothing to sustain it except the small watery shoots. This is almost invariably the case in wet seasons.

Concord.—This variety has been in bearing only to a limited extent. So far, it seems to promise well, and is likely to be cultivated extensively. It has several good properties, being perfectly hardy, seldom or never mildews; a remarkably free grower, and a week or ten days earlier than the Isabella, and in quality nearly if not quite equal to this variety.

Diana.—Although not so well known as the Catawba, it has been cultivated for some time. So far, it does not seem to give very good satisfaction; the bunches, also the fruits, are small compared to this variety. It seems to be a few days earlier, but not enough to make it an object to cultivate it in preference to the Catawba, this being much larger both in bunch and berry, and quite equal to Diana in quality.

Rebecca and *Delaware*—Have not yet got fairly into bearing here. It is to be hoped, however, that they will both succeed, as they will prove a great acquisition to our table varieties. They have been, thus far, rather inclined to take mildew when young, but with age, it is hoped, they will be free from this calamity. Canby's August, To-Kalon, Clinton, Norton's Seedling, and several other native sorts, are on trial, but have not yet got fairly established, so that no opinion can yet be given in regard to their suitability for cultivation.

GOOSEBERRIES

On light soils, have produced excellent crops free from mildew. On heavy soils, although considered the best for this fruit, they have been for several years lost entirely from this cause. White and yellow varieties seem to succeed the best. The Houghton gooseberry is free from mildew, and although of small size, bears abundantly and is valuable for making tarts; this variety seems to succeed on any soil.

CHERRIES.

For the last two years, in this section of the country, cherries have not been so fine as usual. In 1857, we had a tolerably fair crop of some kinds; this season there has been almost a failure, particularly of the white varieties, which, with very few exceptions, have rotted before getting ripe. Napoleon Bigarreau, and the old Bigarreau, or Graffion,

which are generally large and fine, have also entirely failed. May Dukes and Morellos have done better and produced good crops. The following varieties have been the best, and are recommended for general cultivation:

Purple Guigne—If it were possible to get the fruit, is one of the earliest by ten or twelve days, but unless a great number are planted or in some way protected, the birds are sure to take them as fast as they get ripe.

Coe's Transparent—Is one of the first good cherries that ripens here, being a few days earlier than Knight's Early Black, and quite equal to any cherry grown, hardy and a good bearer, and worthy of general cultivation.

Knight's Early Black—Is also an excellent early cherry, nearly or quite equal to Black Tartarian, ripening a few days earlier.

Black Tartarian, *Black Eagle*, *Downer's Late Red* and *Black Heart*, (the old original variety,) are all popular kinds for general cultivation. The old Black Heart produces larger crops, and more sound cherries, than any variety we have in cultivation, ripening a week after Black Tartarian, and, although not quite so large as this variety, yet of excellent quality; all those who cultivate to sell, ought to plant this variety extensively. Bigarreau and Napoleon Bigarreau are two of the best light cherries; in ordinary seasons, they produce large crops. All of the early White Hearts are worthless, compared to other early kinds.

May Duke and *Morello.*—These two classes of cherries ought to be extensively cultivated; when taken into consideration they are of more value than the Heart or sweet varieties; as they are not only very hardy, but seldom fail to produce large crops, beginning with the May Duke and Early Richmond (Kentish;) the former is also an excellent table cherry when perfectly ripe, and one of the best for culinary purposes. The Early Richmond, or Kentish, ripens about the same time as the May Duke, and continues in season for some time. This variety is used altogether for tarts or pies, and is always saleable in our markets and profitable to cultivate. Later again are, Reine Hortense, a fine hardy cherry of the May Duke tribe, excellent for cooking, and one of the handsomest grown; this variety succeeds remarkably well. After this, the common Morello comes in season, a great bearer, but liable for the last few years to become knotty. Two of the latest cherries are the English Morello and Carnation; the former a sure bearer, fruit growing to a large size and hanging on the tree, without rotting, longer than any known. This variety is very acid and requires a large quantity of sugar to preserve it. The English Carnation is also a very valuable cherry, when well ripened, excellent for table use, as well as cooking. This variety has a great resemblance to Belle Magnifique, a French cherry, and is supposed to be identical.

CURRANTS.

Many new kinds are added from year to year, and being easily raised from seed, no doubt improvements will be attained. The Red and White Dutch, White Grape, and Cherry, are the varieties in general cultivation, and for a main crop can be relied on. The Cherry Currant is one of the largest at present in cultivation, the fruit frequently being as large as a Mazzard cherry. The following kinds have done well: Victoria, Knight's Sweet Red, Red Grape; also two or three French varieties promise well. Currants are a fruit that seldom if ever fails to bear fine crops, even with ordinary care, but when the ground is well prepared by trenching and manuring before planting, the difference in the size is astonishing, so that they are frequently taken for distinct varieties. they require pruning, that is, thinning out the branches and shortening moderately; they are also improved by a slight thinning of the young shoots, in May.

RASPBERRIES.

For market culture, the great desideratum is to procure hardy varieties, that will stand without covering in winter. This we have not yet been enabled to obtain, except what have been raised from the common Red or English raspberry. By raising seedlings, we frequently get superior sorts, and some of them will be almost as large as the Antwerp varieties. A little more attention to the raising of seedlings from the best sorts, both Antwerp and common kinds, will no doubt enable us to get them of large size, as well as hardy. There is nothing so easy to raise from seed as raspberries. Save some of the best berries, wash the seed out and sow at the time of gathering, or in the spring, in hot-beds, transplant the beginning of summer in rows, they will bear abundantly the second year. The following varieties are cultivated here: The Franconia, although not hardy, requiring protection, is cultivated to some extent for market, being rather firmer and not so liable to get injured in marketing as the Fastolf, which is one of the best of the Antwerp varieties, but requires protection in winter. For marketing it is rather soft, and not so well adapted as some others. North River Antwerp; a variety cultivated extensively in the vicinity of Newburgh; canes light grey, and rather smoother than some of the Antwerps. It is also tender, requiring covering, but a very good bearer; berries of medium size.

Brincklé's Orange is beginning to be cultivated to some extent and has proved of excellent quality, one of the best of the white or yellow varieties. The common Red and Purple-fruited are also cultivated extensively, but do not command the price of the Antwerps The twice, or perpetual bearing varieties, have been neglected by most cultivators, not being profitable, or rather, in a season when the demand is limited. Raspberries are found to be

profitable for marketing, being much less expensive in gathering than other small fruits, and when good canes have been preserved, yield abundantly.

STRAWBERRIES.

This season and the previous one have both been favorable for the strawberry, and good crops have generally been secured, where any attention has been bestowed on their cultivation. Without this, many of our finest varieties will be little better than the poorest. To have strawberries in the highest perfection, they must have room to grow and the runners be cut off several times in the course of the season. If this is done, the fruit will be double the size that it would be under ordinary cultivation, much less trouble and expense to gather, and would command in our markets double the price of ordinary grown fruit. All that is necessary in the cultivation of this fruit is, to put the ground in good order, by trenching, or, when they are to be cultivated extensively for market, the ground may be prepared by using the sub-soil plough, with plenty of manure. Plant the rows 3 feet apart, and 15 to 18 inches in the row; at this width, the cultivator may be used in keeping clean.

The following varieties have proved good the past season here and have borne abundantly:

Wilson's Seedling.—This variety is very popular, being an abundant bearer, and of large size, and is a staminate. Longworth's Prolific, and Extra Red, are the best Cincinnati varieties, yielding large crops. Early Scarlet and Iowa are generally planted as early sorts. Among the English varieties, Trollope's Victoria has done the best, producing berries of a large size, and is good for a late crop. Hovey's Seedling is also grown extensively, and where proper cultivation is given, produces good crops. A number of new seedlings has been grown within the last two or three years. A late variety raised by Mr. Boyden, of Newark, and named by him "Late Mammoth," valuable on account of its lateness, continuing a week after all others are gone, is a large, fine berry, and of a uniform size. Peabody's Seedling has also been in bearing, but does not prove so good here as it does in the South; Wilson's, Hovey's, and others being superior, both in size and quantity.

It must not be forgotten, however, that some kinds of strawberries, like many other fruits, succeed in certain soils better than others; which can only be known by making a trial. Let every person who grows strawberries raise a few seedlings every year, from the best varieties, which can be done without much loss of ground or time, and if the seeds are sown immediately after the fruit is ripe, in the shade, they will frequently produce fruit the following year, and bear abundantly the second. Many of these will be equal to kinds that have a reputation, and a few may be superior in size and bearing qualities, but great care ought to be taken to distribute nothing for cultivation unless they really possess some merit over varieties already known.

BLACKBERRIES.

The severe winters of 1856–'57, injured the tops of all the blackberries in this vicinity, so that little fruit was produced. The past winter, however, was much milder, and the plants have stood without the least injury, producing extraordinary crops of fine sized berries. There is nothing more abundant, in the way of small fruits, than the blackberry, which continues to bear for several weeks, filling up the season after raspberries and currants, until the larger fruits are mature. The variety called New Rochelle, or Lawton, is the kind in general cultivation here. Dorchester, or High Bush, is also in cultivation; both varieties promise to be productive. The New Rochelle is considered the best. Acres of ground being planted with it.

At the last meeting of the Pomological Society, at Rochester, considerable discussion took place in relation to the proper name of the New Rochelle blackberry. For the information of those who may not be familiar with its history, I would state, that more than twenty years ago it was introduced, and known as Secor's blackberry, and afterwards called New Rochelle. The plants were sold at that time at $3 per dozen, but being little known, it was some years before they were cultivated to much extent. Shortly after being known, however, they were advanced to the fabulous price of $6 and $9 per dozen. The same variety afterwards had "Lawton" added to it, and is now sold by nurserymen as the New Rochelle or Lawton blackberry.

NEW YORK.

FROM H. E. HOOKER, OF ROCHESTER.

APPLES.

Best six varieties for family use, but very incomplete, not affording a full succession:

Red Astrachan	10	Baldwin	24
Fall Pippin	12	Talman Sweet	20
Rhode Island Greening	24	Roxbury Russet	10

Best twelve varieties for family use—

Early Harvest	4	Twenty Ounce	8
Red Astrachan	4	Rhode Island Greening	24
Sweet Bough	4	King of Tompkins County	4
Primate	4	Talman Sweet	10
Gravenstein	4	Baldwin	18
Fall Pippin	6	Roxbury Russet	10

Best twenty varieties for family use—

Early Harvest	4	Twenty Ounce	8
Red Astrachan	4	Rhode Island Greening	12
Early Joe	2	King of Tompkins County	6
Primate	2	Fameuse	4
Sweet Bough	2	Mother	4
Jersey Sweet	2	Talman Sweet	8
Porter	2	Ladies' Sweet	4
Fall Pippin	4	Baldwin	10
Gravenstein	4	Northern Spy	4
Belmont	4	Roxbury Russet	10

Best varieties for market—one thousand trees—

Red Astrachan	60	Rhode Island Greening	200
Golden Sweet	60	Talman Sweet	100
Duchesse of Oldenburg	80	Baldwin	200
Twenty Ounce	200	Roxbury Russet	100

PEARS.

Best six varieties on pear stocks:

Beurré Giffard,
Bartlett,
Tyson,
Seckel,
Sheldon,
Lawrence.

For twelve, add to the above—

Bloodgood,
Flemish Beauty,
Duchesse d'Orléans,
Beurré Clairgeau,
Winter Nelis,
Vicar of Winkfield.

Best six varieties on quince for family use—

Beurré Giffard,
Brandywine,
Belle Lucrative,
Duchesse d'Angoulême,
Louise Bonne de Jersey,
Vicar of Winkfield.

For twelve, add to the above—

Beurré Langelier,
Beurré Diel,
Urbaniste,
Easter Beurré
Glout Morceau,
Beurré d'Anjou.

For market on pears—

Bartlett,
Sheldon,
Lawrence,
Flemish Beauty,
Vicar of Winkfield.

On quince stocks—

Duchesse d'Angoulême,
Louise Bonne de Jersey,
Glout Morceau,
Easter Beurré,
Vicar of Winkfield.

PEACHES.

Best six varieties for family use:

Early York Serrate,	Oldmixon Freestone,
Newington's Early,	Oldmixon Cling,
Crawford's Early,	Red-Cheeked Melocoton.

For twelve, add—

Coolidge's Favorite,	George IV.,
Water's Early,	Crawford's Late,
Morris White,	Longworthy's Late Rareripe

Orchard of one hundred trees—

Early York Serrate	25	Oldmixon Cling	10
Crawford's Early	20	Red-Cheeked Melocoton	15
Oldmixon Freestone	20	Longworthy's Late	10

OHIO.

FROM THE STATE POMOLOGICAL COMMITTEE.

Most fruits do well in this State. Our soils are generally fertile, and composed of transported material, chiefly independent of the rock formations on which they lie, but sometimes commingled with the detritus of our own rocks, more or less distant from the places where the deposits are found. The clays and sands in the north part of the State appear to have been transported from a great distance; so of the gravels; but we often find the shales, sandstones, and limestones of our own limits mingled with these deposits. Hence we are favored with a varied soil, containing a rich variety of materials for the food of plants. In some cases, the soil is characterized by the rocks upon which it rests and from which it has evidently been derived. Lime abounds almost everywhere, but potash, though in sufficient quantity, does not frequently appear in the soil or sub-soil; so also the phosphates are in sufficient quantity.

Little attention has been paid to the application of fertilizers, and we are not prepared to report any definite results, though many experiments have been attempted with special manures. Thorough culture, wherever applied, has always been found serviceable, and followed by good effects; this applies to the trenching of the soil as performed in our vineyards. The strawberry has also proved superior in productiveness when upon trenched soil. The majority of the soil in the neighborhood of Cincinnati, where these two crops are largely and profitably grown, is a rather stiff limestone clay and clayey loam; but both of these plants appear to do best where the loam predominates, being made up in larger proportion of the heterogeneous materials of the diluvium, better than on the stiffer clays derived from our own blue limestones.

The Catawba grape and the Hudson, Hovey, Iowa, and Black Pine strawberries have been grown for many years, and do not evince any signs of decrepitude or wearing out; some old varieties, indeed, appear to have been rejuvenated in our soils.

APPLES.

For market.—The Wine Sap, Yellow Belle-fleur, Gate, Rawle's Janet, Rome Beauty, White Winter, Pearmain, Smith's Cider, Ortley, Milam, White Pippin, Red Canada, Peck's Pheasant, Prince's Harvest, Strawberry, Maiden's Blush, Cooper, and Red Astrachan have proved among the most profitable in different parts of this State.

For table.—Those most admired are Yellow Belle-fleur, Ortley, Newtown Spitzenberg, Newtown Pippin, Red Canada, Rambo, American Golden Russet, Summer Pearmain, Prince's Harvest, and Fall Pippin.

PEARS.

For market.—The White Doyenné, Flemish Beauty, Louise Bonne de Jersey, Bezi de la Motte, Clion, Bartlett, Napoleon, and some inferior sorts are profitable varieties.

For table.—We would name first, the Seckel, Washington, White Doyenné, Bartlett, Doyenné d'Été, St. Ghislain, Belle Lucrative. Glout Morceau, Easter Beurré, and the Winter Nelis, among those sufficiently well known. Many new varieties, but partially tested. promise to become favorites.

We suppose the number of pears profitably cultivated on quince stocks to be limited to ten or a dozen, but we need more extended observations. For the cherry; we have already answered in favor of dwarf stocks; the Morellos are also preferred for many kinds of small and inferior growth. For the plum the wild stock has been recommended, but we think neither it nor the peach should ever be used, unless when worked so low as to force the scion to take root itself. We have also seen very fine growth of pears on apple stocks, treated in this way, but, of course, the trees were as grown from cuttings; the cells of the pear do not assimilate with those of the apple, and the root of the latter dies away as soon as the graft has formed its own fibers.

PEACHES AND CHERRIES.

Peaches and cherries, except in favored localities, are not found profitable, and are a cause of disappointment in numerous instances. The former are most sure on elevated ridges of thin soil; the latter, appear to enjoy immunity from harm on the shores of Lake Erie. In other places, the Morellos only, seem to repay the planter and prove profitable for market. Among these the Early May (Early Richmond?) has proved itself everywhere the most profitable variety. We believe that the grafting of other and finer sorts on the Mahaleb

stock, may prove to some extent a safe-guard, especially if low pyramidal heads are formed in growing the trees, and that this mode of forming the head is the best prevention of the bursting of the bark.

GRAPES.

Extensive vineyards have been planted in the southwestern portion of the State, where the grape-culture may be considered as fairly established. The want of knowledge upon the subject caused the expenditure of much money, labor, and time in experimenting. Large numbers have been imported from those portions of the grape region of Europe, which were supposed to be most like our own country in soil and climate; all foreign grapes have yielded, however, to the native Catawba, which is now admitted to be the grape for this region. The Isabella and Schuylkill are rapidly disappearing. The Missouri is not profitable. The Ohio, or Cigar-box, like the Herbemont and Lenoir, is a free grower, but apt to suffer from frost. The Minor or Venango may prove valuable to flavor other wines, but will not be largely propagated. The Diana, Clinton, Concord, Delaware, Shaker, and several others are cultivated to a limited extent, and have their admirers. A new grape, which originated as an accidental seedling, in the city lot of H. Ives, some years ago, and which bears his name, is now beginning to attract attention, since its diffusion in the county, where it grows, bears abundantly, and appears to be quite free from the disease known as "the rot," which affects the Catawba and some other grapes. This variety may be a seedling from the Isabella, being a dark blue or black; and like many seedlings from this and the Catawba, shows a tendency to "run back" towards the Fox grape, and is manifested especially in the foliage. This is no recommendation with us, among whom the Charter Oak, Northern Muscadine, and the whole Fox family are much disliked, though praised by some.

We should mention that, although the grape region is chiefly confined to the vicinity of the Ohio River, it has been extending into the interior, and, in a few instances, with a prospect of success. Even near the northern margin of the State, in those favored situations where the influence of the lacustrine atmosphere prevails, the grape is cultivated with remarkable success. This is particularly the case at Kelly's Island, in Lake Erie, off Sandusky Bay. The soil there is chiefly a black, peaty loam of moderate depth, resting upon a thick stratum of stiff clay, abounding in boulder stones, many of which are of granitic character, but also abounding in limestone, upon which the diluvium rests, and which has been much worn and broken by the diluvial agency. Grapes also grow and ripen pretty well at Cleveland, near the shore of the Lake, upon a sandy soil, resting on shale and limestone, but near the sandstone outliers of the coal field. Upon this soil are found the chestnut, Magnolia acuminata, the Baptisia indigofera, and other plants that are quite unknown in our Southern grape region.

PLUMS.

Plums have not succeeded well, but sometimes escape the ravages of the curculio.

For Market.—Washington, Deane's Purple, Yellow Gage, Prince's Imperial, Bleecker's, Smith's Orleans, and Damson are profitable.

For Table.—Green Gage, Coe's Golden, Imperial, Washington, and Smith's Orleans are preferred.

Shaking the trees and sprinkling with the lime and sulphur wash are the best antidotes to the curculio.

PENNSYLVANIA.

FROM THOMAS M. HARVEY, OF JENNERSVILLE.

APPLES.

At present, the selection for establishing orchards in this section would be about as follows:

For one hundred trees of six varieties:

Early Harvest	5	Smoke House	25
Fallenwalder	20	Golden Russet, of Massachusetts, (sometimes called Long Island Russet)	20
Townsend	10		
Baldwin	20		

For an orchard of one hundred trees, twelve varieties—

Early Harvest	2	Baldwin	10
Jeffries	3	Lady	10
Rhode Island Greening	10	Summer Rose	2
Roman Stem	10	Smoke House	20
Townsend	4	American Golden Russet	10
Holland Pippin	4	Golden Russet, of Massachus'ts	10

For an orchard of one hundred trees, twenty varieties—

Knowles' Early	1	Fallenwalder	10
Summer Rose	1	American Golden Russet	5
Maiden's Blush	4	Smith's Cider	5
Rambo	5	Golden Russet, of Massachusetts	10
Baldwin	6	Townsend	3
Wine Sap	5	Jeffries	2
Pennock	5	Smoke House	15
Early Harvest	2	Paradise	5
American Summer Pearmain	2	Roman Stem	5
Holland Pippin	4	Ailes	5

For an orchard of one thousand trees for market—

Early Redstreak	25	Lady	100
Maiden's Blush	25	American Summer Pearmain	25
Smith's Cider	100	Fallenwalder	100
Townsend	25	Golden Russet, of Massachusetts	100
Smoke House	500		

PEARS.

One hundred trees on pear roots, six varieties:

Beurré Giffard	5	Seckel	15
Bartlett	10	Belle Lucrative	10
Tyson	10	Lawrence	10

One thousand trees on pear roots, twelve varieties—

Doyenné d'Été	25	Belle Lucrative	50
Rostiezer	25	Duchesse de Brabant	25
Washington	25	Tyson	50
Seckel	100	Bartlett	500
Beurré Giffard	50	Beurré Bosc	25
St. Ghislain	25	Lawrence	100

Six kinds that do well on quince—

Rostiezer.	Duchesse d'Angoulême.
Louise Bonne de Jersey.	Belle Lucrative.
Brandywine.	Glout Morceau.

PEACHES.

For an orchard of one hundred trees, six varieties—

Troth's Early Red	15	Ward's Late Free	20
George IV.	15	Coolidge's Favorite	10
Large Early York	20	Molden's White	20

For an orchard of one thousand trees, twelve varieties—

Troth's Early Red	150	Crawford's Late Molocoton	100
Coolidge's Favorite	50	Ward's Late Free	100
Oldmixon Free	25	Red Rareripe	50
Molden's White	100	Morris White	25
Large Early York	200	Druid Hill	50
George IV	50	Late Heath.	100

GRAPES.

Considerable attention is being paid in this neighborhood to the cultivation of native grapes. We have now about one hundred named varieties on trial, and know of hundreds of seedlings coming on, to claim our attention. This is a laudable enterprise, and deserves to be

fostered. Foreign grapes, we know are not adapted to our climate. Had our ancestors turned their attention to natives, by this time, many of our hills might have been covered with flourishing vineyards.

The *Catawba* and *Isabella* have been the grapes chiefly cultivated, very satisfactorily sometimes, but not always. Some seasons, they are nearly destroyed by mildew, scab, or rot. We aim at overcoming some of these imperfections by the new seedlings adapted to our climate. It requires time to test them, and there is prudence in not attempting to report until better prepared.

STRAWBERRIES.

We have tested about one hundred varieties of strawberries this season. The list of real acquisitions is short:

Wilson's Albany is decidedly the most valuable for productiveness; we know of no equal. A neighbor counted on one hill, second year from planting, (runners kept off,) two hundred and eighty berries. For size and firmness, it is about equal to any, and quality very good. We look with interest to some of its progeny, inheriting the present good properties, improved in quality.

McAvoy's Superior.—Next in order, we prefer McAvoy's Superior.

Triomphe de Grande.—For size and quality, Triomphe de Grande is very fine, but we have yet to learn of its productiveness.

Reade's No. 1 and *Black Pine*—From Canada, are deserving of further trial.

Peabody—In quality is good enough, but in size and productiveness it does not come up to recommendation with us.

The *Germantown*—Sent out as a new variety, proves to be Hovey's Seedling, improved by special manure. The new varieties which are so fine on Long Island do not any of them do so well here.

These remarks might be prolonged considerably, but it is thought not best to condemn hastily. We need but few varieties, and they should be the very best.

The strawberry blossom, I consider, in its normal condition, a perfect flower, furnished with pistils and stamens; but for different varieties, a peculiarity of climate and soil is requisite for the full development of both sets of organs. So, by submitting a variety of kinds to the same culture, we have some with pistils, only, well developed, others having only stamens, while some have both in perfection. The practical gardener knows that varieties having only pistils developed must have plants with stamens planted near by, in order to perfect a crop. It is a fact not generally known, but should be more diffused, that the pistils of the Hautbois will not be fertilized by the pollen of another species; hence, in practice, there are many unproductive beds of that sort. There are plants of the Hautbois species, with stamens only well developed. A few of these should be planted in proximity to the beds of pistillates to secure a crop of fruit.

VIRGINIA.

FROM H. R. ROBEY, OF FREDERICKSBURG.

APPLES.

For an orchard of one hundred trees, the following list is given:

White Juneating, or May Apple	5
Stripe June (not Red June)	5
Carter, Virginia, a handsome white	5
Summer Golden Pippin	5
Porter Apple	5
Red Cathead, Virginia	5
Baltimore Pippin	5
Robey's Seedling	5
Winter Cheese, ripe in December	5
Brookes' Pippin, January to April	10
Holiday's Seedling, February to April	10
Rawle's Janet, January to March	10
Northern Spy, January to March	5
Wine Sap, January to March	10
Limber-Twig, January to May	10

For an orchard of one thousand trees, the following list is given—

White Juneating, or May Apple	20
Stripe June	20
Carter, Virginia	20
Summer Golden Pippin	20
Summer Rose	20
Spice, Virginia	20
Porter Apple	20
Red Cathead, Virginia	20
Baltimore Pippin	20
Robey's Seedling	20
Robertson's White	20
Yellow Belle-fleur	20
Bowling's Sweet	10
Winter Cheese	50
Brookes' Pippin	50
Holiday's Seedling	50
Rawle's Janet	50
Northern Spy	50
Wine Sap	50
Limber-Twig	50
Waugh's Crab	50
Strawn's Seedling	50
Wellford's Yellow	50
Ogleby	50
Milam	50
Long Island Russett	50
Nickajack	50
Cullasaga	50

The above list contains none but what have been thoroughly proved and known to be good.

PEARS.

For an orchard of one hundred trees, standards, twenty varieties—

Bartlett,
Julienne,
Beurré d'Amanlis,
White Doyenné,
Nouveau Poiteau,
Seckel,
Vicar of Winkfield,
Hawe's Winter, Virginia,
Taylor's Winter, Virginia,
Lawrence,
Catinka,
Madeleine,
Fondante d'Antomne,
Tyson,
Beurré Diel,
Beurré Oswego,
Urbaniste,
Flemish Beauty,
Winter Nelis,
Buffum.

On quince stocks, twenty varieties—

Madeleine,	White Doyenné,
Julienne,	Fondante d'Automne,
Bartlett,	Easter Beurré,
Rousselet de Stutgart,	Glout Morceau,
Beurré Diel,	Lawrence,
Duchesse d'Angoulême,	Taylor's Virginia,
Oswego Beurré,	Winter Nelis,
Louis Bonne de Jersey,	Van Mons Leon Le Clerc,
Seckel,	Bezi de La Motte.
Vicar of Winkfield,	Beurré Clairgeau.

In giving this list, we would state that we have the most of them in bearing from five to twenty-two years—standards and dwarfs. The oldest dwarfs, now twenty-five years old, are as thrifty as the day they were planted. The trees were set in the ground from 1 to 5 inches below the graft. The soil is a strong loam; the ground cultivated with vegetables, and manured alternate years.

CATALOGUE OF FRUITS FOR GENERAL CULTIVATION.

[Recommended by the American Pomological Society, at their Session, in the City of New York, in September, 1858.]

APPLES.

American Summer Pearmain,	Melon,
Autumn Bough,	Minister,
Baldwin,	Monmouth Pippin,
Benoni,	Porter,
Bullock's Pippin,	Primate,
Carolina June,	Rambo,
Danvers Winter Sweet,	Red Astrachan,
Early Harvest,	Rhode Island Greening,
Early Strawberry,	Roxbury Russet,
Fall Pippin,	Smith's Cider,
Fameuse,	Summer Rose,
Gravenstein,	Swaar,
Hawley,	Vanderveer,
High-Top Sweeting,	Wagner,
Hubbardston Nonsuch,	Williams' Favorite,
Jonathan,	(except for light soils,)
Lady Apple,	Wine Apple, or Hayes,
Ladies' Sweet,	Wine Sap.
Large Yellow Bough,	

PEARS.

Ananas d'Eté,
Andrews,
Bartlett,
Belle Lucrative, or
  Fondante d'Automne,
Beurré d'Anjou,
Beurré d'Aremberg,
Beurré Diel,
Beurré Bosc,
Beurré St. Nicholas,
Beurré Clairgeau,
Beurré Giffard,
Beurré Superfin,
Brandywine,
Bloodgood,
Buffum,
Cabot,
Dearborn's Seedling,
Doyenné d'Été,
Doyenné Boussoch,
Doyenné d'Alençon,
Flemish Beauty,
Fulton,
Golden Beurré of Bilboa,
Howell,
Kingsessing,
Lawrence,
Louise Bonne de Jersey,
Madeleine,
Manning's Elizabeth,
Onondaga,
Osband's Summer,
Paradis d'Automne,
Rostiezer,
Seckel,
Sheldon,
St. Michael Archange,
Tyson,
Urbaniste,
Vicar of Winkfield,
Winter Nelis,
Uvedale's St. Germain, or
  Belle Angevine (for baking.)

For cultivation on Quince Stocks.

Beurré Superfin,
Beurré Hardy,
Buffum,
Belle Lucrative,
Belle Epine Dumas,
Beurré d'Amaniis,
Beurré d'Anjou,
Beurré Diel,
Beurré Langelier,
Catillac,
Duchesse d'Angoulême,
Doyenné d'Alençon,
Easter Beurré,
Figue d'Alençon,
Glout Morceau,
Louise Bonne de Jersey,
Napoleon,
Nouveau Poiteau,
Rostiezer,
Soldat Laboureur,
St. Michael Archange,
Urbaniste,
Uvedale's St. Germain, or
  Belle Angevine,
Vicar of Winkfield,
White Doyenné.

APRICOTS.

Breda, Large Early, Moorpark.

NECTARINES.

Downton, Early Violet, El Ruge.

PEACHES.

Bergen's Yellow,
Crawford's Early,
Coolidge's Favorite,
Crawford's Late,
Early York, (serrated,)
George IV.,
Grosse Mignonne,
Morris White,
Early York, (large,)
Hill's Chili,
Large White Cling,
Madeleine de Courson,
Téton de Venus,
Oldmixon, Free,
Oldmixon, Cling.

PLUMS.

Bleecker's Gage,
Coe's Golden Drop,
Green Gage,
Jefferson,
Lawrence Favorite,
Lombard,
Munroe,
Purple Favorite,
Prince's Yellow Gage,
Purple Gage,
Reine Claude de Bavay,
Smith's Orleans,
Washington,
McLaughlin.

CHERRIES.

Belle d'Orléans,
Belle Magnifique,
Black Eagle,
Black Tartarian,
Coe's Transparent,
Downer's Late,
Early Purple Guigne,
Governor Wood,
Elton,
Early Richmond, (for cooking,)
Graffion, or Bigarreau,
Knight's Early Black,
May Duke,
Reine Hortense.

GRAPES.

Under glass.

Black Damascus,
Black Hamburg,
Black Frontignan,
Black Prince,
Chasselas de Fontainebleau,
Red Chasselas,
Zinfindal,
Cannon Hall Muscat,
Grizzly Frontignan,
White Frontignan,
White Muscat of Alexandria,
White Nice,
West's St. Peter.

Open culture.

Catawba,
Concord,
Isabella,
Delaware,
Diana.

CURRANTS.

Black Naples,
May's Victoria,
Red Dutch,
White Dutch,
White Grape.

GOOSEBERRIES.

Crown Bob,
Early Sulphur,
Green Gage,
Green Walnut,
Houghton's Seedling,
Ironmonger,
Laurel,
Red Champagne,
Warrington,
Woodward's White Smith.

BLACKBERRIES.

Lawton's New Rochelle,
Dorchester.

RASPBERRIES.

Fastolff,
Franconia,
French,
Knevett's Giant,
Orange,
Red Antwerp,
Yellow Antwerp.

STRAWBERRIES.

Boston Pine,
Hovey's Seedling,
Burr's New Pine,
Longworth's Prolific,
Large Early Scarlet,
Hooker's Seedling,
Wilson's Seedling.

NEW VARIETIES OF FRUIT WHICH PROMISE WELL.

APPLES.

Broadwell Apple,
Buckingham,
Coggswell,
Fallenwalder,
Genesee Chief,
Jeffries,
King of Tompkins County,
Mother,
Smoke House,
White Winter Pearmain,
Winter Sweet Paradise,
Winthrop Greening, or Lincoln Pippin.

PEARS.

Adams,
Alpha,
Bergen,
Beurré d'Albret,
Beurré Gris d'Hiver, (nouveau,)
Beurré Hardy,
Beurré Kennes,
Beurré Langelier,
Beurré Nantais,
Chancellor,
Charles Van Hooghten,
Collins,
Comte de Flandreo,
Conseilleur de la Cour,
Comtesse d'Alost,
Delices d'Hardenpont de Belgique,
Dix,
Rousselet d'Esperen,
Sterling,
Theodore Van Mons,
Duchesse de Berri d'Eté,
Emile d'Heyst,
Fondante de Conice,
Fondante de Charneuse,
Fondante de Malines,
Fondante de Noël,
Henkel,
Hosen Schenck,
Hull,
Jalousie de Fontenay Vendée,
Kirtland,
Lodge, (of Pennsylvania,)
Niles,
Ott,
Philadelphia,
Pinneo,
Pius IX.,
Pratt,
Van Assche,
Walker,
Zepherine Gregoire.

PEACHES.

Téton de Venus,
Gorgas,
Hill's Chili,
Madeline de Courson,
Susquehannah.

PLUMS.

Bradshaw,
Duane's Purple,
Fellenberg,
General Hand,
German Prune,
Ives' Washington Seedling,
Munroe,
Pond's Seedling,
Rivers' Favorite,
St. Martin's Quetsche,
White Damson.

CHERRIES.

American Amber,
Bigarreau Monstreuse de Mezel,
Black Hawk,
Great Bigarreau,
Rockport Bigarreau,
Hovey,
Kirtland's May,
Ohio Beauty,
Walsh's Seedling.

GRAPES.

Herbemot,
Logan,
Rebecca,
Union Village.

CURRANTS.

Versailaise,
Cherry,
Fertile de Pallua.

RASPBERRIES.

Cope,
Catawissa,
Thunderer,
Walker.

STRAWBERRIES.

Genesee,
Le Baron,
McAvoy's Superior,
Scarlet Magnate,
Trollope's Victoria,
Walker's Seedling.

For particular localities.

APPLES.

Canada Red,
Esopus Spitzenberg,
Newtown Pippin,
Northern Spy,
Yellow Belle-fleur.

PEARS.

Grey Doyenné,
White Doyenné.

PEACHES.

China Cling,
Heath Cling,
Carpenter's White.

PLUMS.

Imperial Gage.

STRAWBERRIES.

Burr's New Pine,
Jenney's Seedling.

For northern localities.

APPLES.

Ribstone Pippin.

For gardens.

APPLES.

Garden Royal.

CHERRIES.

Napoleon Bigarreau (for special cultivation.)

METEOROLOGY.

METEOROLOGY IN ITS CONNECTION WITH AGRICULTURE.

BY PROF. JOSEPH HENRY, SECRETARY OF THE SMITHSONIAN INSTITUTION.

In the preceding articles on Meteorology, published in the Reports of the Patent Office, we have given the laws which govern the general movements of the atmosphere, and some of the perturbing influences which interfere with the simpler operation of these laws. We have seen that the great motive power which gives rise to the various currents of the aerial covering of our globe is the unequal distribution of the heat of the sun; the elevated temperature of the equatorial regions heating the air causes it to ascend and flow over toward the pole, while the cold of the frigid zone produces a condensation of the air, which gives rise to downward currents in that region, and a spreading out there in all directions towards the equator.

The simplicity of this movement is first interfered with by the motion of the earth upon its axis, which gives to all the currents flowing towards the equator a curvature to the west, and to all those flowing from the equator a curvature to the east. Another perturbing influence, which has been mentioned, is the unequal heating of the several parts of the different zones of the earth, consisting as they do of alternations of land and water. But the great perturbing cause is the varying quantity of moisture which exists in the atmosphere, and which, by its increase and diminution, gives rise to the varying conditions of the weather, and produces the fitful and almost infinite variety of meteorological changes which occur at different times and in different places. We shall principally devote this essay to an exposition of the phenomena of the vapor of the atmosphere, including that of the various aqueous meteors, such as rain, hail, hurricanes, tornadoes, &c. The meteorology of the United States, as well as its geology, is exhibited on a large scale, and affords one of the best fields on the surface of the globe for studying the general movements of the atmosphere. The subject has attracted much attention on this side of the Atlantic, and a number of laborers have devoted themselves to it with ardor and success; but we regret that the discussions, which unavoidably arise among different investigators, have not always been carried on with the calmness and moderation with which the pursuit of truth should always be conducted. Indeed, meteorology has ever been an apple of contention, as if the violent commotions of the atmosphere induced a sympathetic effect in the minds of those who have attempted to study them.

We have stated in the previous articles that we have no hypothesis of our own to advocate; and while we attempt to reduce the multi-

plicity of facts which have been collected in regard to this subject to general principles, we shall aim at nothing but truth, and endeavor to select from the various hypotheses which have been proposed, such as, in our judgment, are well founded on the established laws of force and motion, and which give the most faithful and explicit expression of the phenomena. We shall be ready at any time to modify or change our views as soon as facts are discovered with which they are incompatible, and indeed we shall hold most of them as provisional truths, which may serve to guide our inquiries, and which are to be established, modified, or rejected by the results of subsequent induction. The statement may be repeated, which has been previously made, that while the general principles of meteorology are well understood, the facts relating to it, on account of the variations and multiplicity of condition, are the most complex of those of any branch of physical science. It has been properly said that astronomy is the most perfect of all branches of knowledge, because its elements are the most simple; and we may say, for a like reason, that meteorology is the least advanced, because its phenomena depend upon the concurrence of so many and such a variety of causes.

VAPOR OF THE ATMOSPHERE.

The air at all times contains water in an elastic, invisible state, called vapor. To prove this, it is sufficient to pour into a bright metallic or glass tumbler a quantity of cold water, the outside of which will become covered with dew. If the vessel were pervious to the liquid, we might suppose the water which appears on the outside to come from within, but this cannot be the case with a metallic or glass vessel, and the only source to which we can refer the dew is the amosphere. The stratum of air immediately around the vessel is cooled by contact with its sides, and a portion of its vapor reduced to water. The air thus cooled becomes heavier, sinks down along the side of the tumbler, and gives place to a new portion of which the vapor is also condensed; and in this way the process is continued as long as the temperature of the water is below that of the surrounding air. If the water which trickles down the side of the vessel is chemically examined, it will be found in some cases almost entirely pure, and in others contaminated by animal and other effluvia which are diffused in the atmosphere. If the experiment be made on different days and at different seasons, we shall find a greater or less reduction of the temperature of the liquid within the tumbler is required in order to produce a deposition of the vapor. The greater the number of degrees of this reduction of temperature, the greater will be the evaporation from a given surface of water, and the more intense will be the different effects which depend on the relative dryness of the air. If the experiment be made in summer, and we find but a small reduction of temperature is necessary to produce the deposition of moisture on the outside of the tumbler; and if we attend to the state of our feelings at the same time, we shall experience that peculiar sensation which is referred to what is called the closeness or sultri-

ness of the atmosphere, and which is caused, as we shall see hereafter, by the large amount of vapor with which it is charged.

The phenomena of vapor by itself in a vacuum.—To understand even approximately the effects due to the vapor in the atmosphere, it is necessary that we should first carefully study the phenomena of water in an aeriform condition as it exists by itself or separated from the atmosphere; and for this purpose we may employ the ingenious method devised by Dr. Dalton, of Manchester, England, to whose researches in meteorology and other branches of physical science we are more indebted than to those of almost any other individual of the present century. He employed in these researches a glass tube of about 40 inches in length, closed at one end, and filled with dry and warm mercury. The tube thus filled was inverted with its lower end in a basin of the same metal, and thus formed an arrangement similar to that of an ordinary barometer, in which the pressure of the air, as is well known, forces up the mercury and keeps it suspended at an elevation of 30 inches, when the experiment is made at the level of the sea. The space above the mercury is a Torricellian vacuum; that is, a space void of all gross matter, save a very attenuated vapor of mercury, which can also be removed by a reduction of temperature below the 50th degree of Fahrenheit's scale, but the correction on this account is so small that it may be neglected. Into this vacuum Dr. Dalton introduced a very small quantity of water, by forcing it from a small syringe into the mercury at the base of the column, whence it rose to the surface and was attended with an immediate depression of the mercurial column, which, when the temperature of the room was at 60°, amounted to nearly half an inch. By this experiment, it was proved that water, at the ordinary temperature, when the pressure of the air is removed, immediately flashes into steam or vapor, and that the atoms of this vapor repel each other, thus producing an elastic force which depresses the column of mercury. In this experiment, the quantity of water introduced was but a few grains, yet it did not all flash into vapor, but a portion of it remained in the form of a thin stratum of liquid on the surface of the mercury. Its weight, however, was insufficient to produce the observed descent of the column, and its effect in this respect could readily be calculated, since its weight was known. The descent of the mercury was therefore due to the repulsion of the atoms of vapor, and the former afforded an accurate measure of the comparative amount of this force.

The tube, as we have stated, was 40 inches long; and since the column of mercury at first occupied but 30 inches of its length, the extent of the vacuum before the introduction of the water was 10 inches, and afterwards 10½ inches. That the depression of the mercury is an exact measure of the elastic force or repulsion of the atoms of the aqueous vapor, will be evident when we consider that if we remove the vapor the column will rise to 30 inches, and will then be exactly in equilibrio with the pressure of the external atmosphere; or, in other words, the two are in exact balance; but if, after the

introduction of the vapor, the column is reduced half an inch in height, it is plain that the force which produces this effect must be just equal to the weight of this amount of mercury.

Dr. Dalton next diminished the length of this vacuum by plunging the lower end of the tube deeper into the basin of mercury, and thereby causing the upper end of the column to be projected farther into the tube; but this produced no difference in the height of the column, the top of which was still depressed to half an inch below the normal height of 30 inches. From this experiment we infer that the repulsion of the atoms of vapor cannot, like that of the atoms of air, be increased by external pressure; for when we attempt to coerce them into a smaller space by external pressure, a portion of them is converted into water, and the atoms which remain in the aeriform condition exert the same amount of préssure as before.

Dr. Dalton next increased the temperature by surrounding the tube containing the mercurial column with a larger tube filled in succession with water of different temperatures; this produced for each temperature a difference in the depression of the height of the column; and when the water was at the temperature of 100°, the depression, instead of being half an inch, was almost precisely three times as much.

Fig. 1.

Fig. 1 represents the apparatus employed by Dr. Dalton, in which *a* is the barometer tube filled with mercury to the height of *f*, and its lower end plunged into the basin of mercury *c*. The graduated scale for measuring the height of the column is denoted by *b*. The larger tube around the barometer tube to contain the water of different temperatures is denoted by *d*. A thermometer, *e*, is inserted at its upper end by which to ascertain the temperature of the enclosed water and, consequently, that of the vapor within the barometer.

With this simple contrivance Dr. Dalton made a series of experiments to determine the repulsion of the atoms of steam; or, in other words, the *elastic force of aqueous vapor*, corresponding to the different degrees of Fahrenheit's scale from zero up to the boiling point. To facilitate the operations and to allow for any changes that might take place in the pressure of the atmosphere during the continuance of the experiment, another tube was placed beside the first, in the same basin, and the descent of the mercurial column of the first tube estimated from the top of that in the second, which, to render the measure more gradrate, may be effected by means of a small telescope, sliding on a accuuated rod, and movable in a horizontal plane.

By placing water of a given temperature within the outer tube and gradually cooling it after each observation, and finally filling the

same tube with freezing mixtures, a table similar to the following was constructed. Dalton's experiments, however, have been repeated with additional precautions by other scientists, and particularly by M. Regnault, from whose work the annexed table has been compiled.

A—Elastic force of aqueous vapor. In English inches of mercury; temperature of Fahrenheit.

DEGREES FAHRENHEIT.	Degrees Fahrenheit.									
	0°.	1°.	2°.	3°.	4°.	5°.	6°.	7°.	8°.	9°.
°	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*	*In.*
0	0.043	0.045	0.048	0.050	0.052	0.055	0.057	0.060	0.062	0.065
10	0.068	0.072	0.075	0.078	0.082	0.086	0.090	0.094	0.098	0.103
20	0.108	0.113	0.118	0.123	0.129	0.135	0.141	0.147	0.153	0.160
30	0.167	0.174	0.181	0.188	0.196	0.204	0.212	0.220	0.229	0.238
40	0.248	0.257	0.267	0.277	0.288	0.299	0.311	0.323	0.335	0.348
50	0.361	0.374	0.388	0.403	0.418	0.433	0.449	0.466	0.482	0.500
60	0.518	0.537	0.556	0.576	0.596	0.617	0.639	0.662	0.685	0.708
70	0.733	0.758	0.784	0.811	0.839	0.868	0.897	0.927	0.958	0.990
80	1.023	1.057	1.092	1.128	1.165	1.203	1.242	1.282	1.323	1.366
90	1.410	1.455	1.501	1.548	1.597	1.647	1.698	1.751	1.805	1.861
100	1.918	1.977	2.037	2.099	2.162	2.227	2.293	2.361	2.430	2.501

The first column of the above table gives the temperature of the water and vapor in the torricellian vacuum for every ten degrees; the second, the depression of the mercury, or the elastic force of the vapor, corresponding to the several degrees of temperature of the first column. The remaining columns give the depression of the mercury for the intermediate degrees, this arrangement being adopted to save space.

For example, if we wish to know the elastic pressure of vapor at the temperature of 70°, by looking opposite to 70°, in the second column, we find 0.733 or nearly seven-tenths and a third inches of mercury. Again, if we wish the amount of repulsive force of the atoms of vapor at the temperature of 86°, we cast our eye along the line of 80°, until it comes under the 6°, which is at the top of the table, and find 1.242 or very nearly an inch and a quarter as the height of a column of mercury which vapor of water will sustain, without being condensed into a liquid, at the temperature of 86°.

By looking along the foregoing table it will be seen that equal increments of heat are attended with more than equal increments of elastic pressure. Thus, while the elastic force of vapor at 20° is sufficient to depress the mercurial column a little more than one-tenth an inch, at 40° it supports nearly two and a half times as much, at 60° five times, at 80° ten times, and at 100° nineteen times. The reason of this is not difficult to understand, since it is evident that the elastic pressure of the vapor must be increased by the action of two causes: First, by increasing the temperature, the vapor tends to expand just as air would do under the same circumstances; and second, by the same increase of temperature, a new portion of water is converted into vapor, which, being forced into the same space, increases the density, and, consequently, the elasticity of the vapor which existed there before.

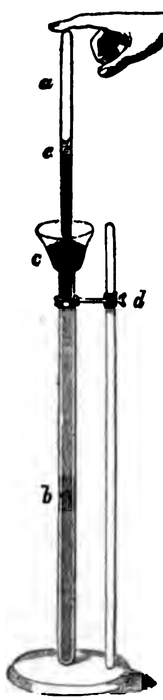
Dr. Dalton also showed that there is a remarkable difference between vapor which exists over water, and vapor separated from

the liquid from which it is produced. In the first case, as we have seen, every increase of temperature causes the formation of a new quantity of vapor, which serves to increase the density and consequently the repulsive energy of the vapor previously existing. Hence, as we have shown before, the expansive power of vapor or steam increases in a geometrical ratio, while the temperature increases in an arithmetrical ratio, that is, an addition of a few degrees of heat produces more than a proportional degree of elastic force. The case, however, is very different with vapor separated from the water from which it is produced; it then obeys the same law as atmospheric air, and increases in elasticity with equal additions of temperature.

It has been stated in a previous article that the atmosphere increases its elastic force by one four hundredth and ninetieth part for every degree of Fahrenheit above the freezing point; the vapor of water follows the same law.

These facts are readily proved by the apparatus exhibited in Fig. 2.

Fig. 2.



So long as any water remains above the mercury in the tube *a b*, the latter may be drawn up or pushed down into the reservoir without altering the height of the column of mercury *c e*. The higher the tube is drawn up, the more water will spring into vapor, while the tension or repulsive energy remains the same, as shown by the invariable height of the mercurial column. When the barometer tube is pushed down into the basin and the space above diminished, a portion of the vapor is converted into water, and this portion increases as the space is made to diminish. If, however, we draw up the tube so that all the water will pass into vapor, a further elevation of the tube will produce an elevation of the height of the mercurial column; the vapor will become rarified and its elastic pressure will consequently be diminished, and hence the increased length of the column of mercury. If sufficient cold and pressure could be applied to atmospheric air, it is not improbable that a portion might be converted into a liquid, just in the same way that an increase of pressure converts the vapor which fills the top of the barometer tube into water. This supposition is the more probable since several gases which were at one time considered permanently elastic have been reduced in this way to a liquid, by the application of a powerful pressure, combined in some cases with a reduction of temperature.

The foregoing table is limited to 100°, and is sufficient for resolving problems relative to the hygrometrical condition of the atmosphere. It is, however, important for the use of the steam engineer that it should be extended to a much higher degree, and accordingly experiments have been made for this purpose by a number of persons, and particularly by M. Regnault at the expense of the French government. From the table thus extended, we may

see that, at the temperature of 212°, the elastic force of vapor balances 30 inches of mercury, and is then just equal to the pressure of the atmosphere. This fact gives the explanation of the phenomenon of boiling, since the vapor formed at the temperature of 212° has just sufficient repulsive power to expand beneath the pressure of the atmosphere, and to pass up in volumes through the water, giving it the peculiar agitation known as boiling.

It is further evident from the same table that vapor is given off from ice, even at zero or 32° below freezing point; if, therefore, a lump of this substance in a cold day be placed under the receiver of an air pump, even when the apparatus is cooled down to zero, a portion of it will immediately spring into vapor, sufficient to fill the whole capacity of the cylinder, when the air is withdrawn; and if this vapor in its turn be removed by working the pump, another portion of the ice will pass into the state of vapor, and if the pressure of this be removed, another quantity of ice will be evaporated; and if the pumping be continued sufficiently long all the ice will be dissipated in vapor without passing through the intermediate condition of water. Instead of continuing to work the pump, in order to evaporate the ice, we may produce the same effect by placing within the receiver a broad dish containing sulphuric acid, which will absorb the vapor as fast as it is formed.

We may, however, convince ourselves immediately of the evaporation of ice by exposing a given weight of it during a cold day in the shade while the temperature is below freezing. It will be found sensibly, though slowly, to diminish in quantity. The same effect, however, is exhibited in the process of drying clothes in cold weather, which though they may be stiffened by the frozen water with which they have been wetted, soon become dry and pliable by the evaporation of the ice.

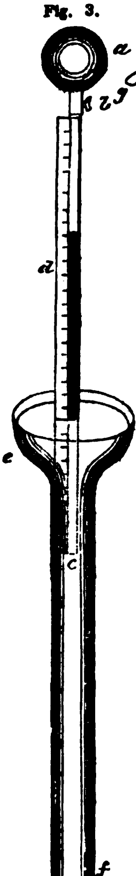
The apparatus of Dr. Dalton enables us to make the following experiment, which has an important bearing on some of the phenomena of meteorology: If, while the column of mercury is at the temperature, for example, of 60°, and a small quantity of water is resting on its upper end, the space above being filled with vapor due to this temperature, we place under the lower end of the tube beneath the surface of the mercury a small crystal of common salt, it will rise through the mercury by its specific levity, and be dissolved in part or whole by the stratum of water at the top. Now, as soon as this solution begins to take place, we shall see the column of mercury ascend; a portion of the vapor will be absorbed, and the tension of the remainder be diminished.

In this case, the attraction of the salt for the particles of water neutralizes a part of their repulsive force and thus diminishes the weight of mercury the vapor can support. For the same reason, salt water boils at a temperature several degrees higher than 212°, though the vapor produced in this case has only the elastic force of that due to pure water. From the foregoing we conclude that the quantity of vapor from the surface of the ocean is less, and has less tension and density, than that from the surface of fresh-water lakes, at the same temperature.

The table which was furnished by Dr. Dalton, and has since been corrected by more refined experiments, is of great value in various branches of science. The very simplicity of the method employed is an evidence of scientific genius of the highest character, and is well calculated to excite our admiration, as well as to call forth our gratitude, on account of the important truths which it reveals. Dr. Dalton, although thoroughly imbued with a love of science for its own sake, and a profound thinker, was eminently a practical man, in the proper sense of the term. He had not only the sagacity to frame significant questions to be propounded to Nature, but also the ingenuity to devise simple means by which the answers to these questions would be given in terms the most precise and accurate.

The weight of vapor.—There are other important questions to be answered in regard to the same subject; and the first we shall consider is the relative weight of a given quantity of vapor in a space fully saturated at different temperatures.

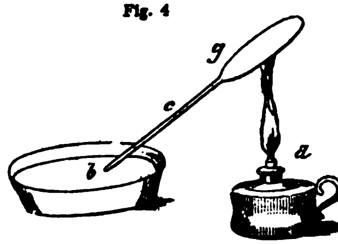
Fig. 3.



The general method of ascertaining the weight of a given quantity of an aeriform fluid consists in weighing a vessel of known capacity when exhausted, and again when it is filled with the air or vapor of which the weight, or in other words the density, is desired. The difference of weights of the vessel in the two conditions evidently gives the weight required. This may serve to give a general idea of the method of determining the *weight* of vapor; but it may be well to dwell a few moments on a more detailed account of one of the processes which has actually been adopted. This consists in employing an apparatus formed of a glass globe (Fig. 3) screwed at *b* to the top of a barometer tube *d*. The capacity of the globe is previously ascertained by weighing it empty and afterwards filled with mercury. The difference of weight gives the weight of mercury sufficient to fill it, and from this it is easy to calculate its contents in cubic inches or parts of a cubic foot. Next, a small hollow bulb of glass *g*, is formed by the blow-pipe, filled with a known weight of water. For this purpose the capillary tube *c*, (Fig. 4, in which the bulb *g* is represented much enlarged,) is plunged beneath a surface of water *b*, and the glass gradually heated by a spirit lamp *d*, by which the air is partially expelled. It is then suffered to cool, when, by the pressure of the atmosphere, a quantity of water is forced up into the bulb. This is made to boil rapidly, so as to expel, along with the escaping steam, all the air. The capillary end of the bulb being again plunged below the surface of the water, and the lamp withdrawn, the pressure of the atmosphere will now entirely fill the bulb with the liquid. The point of the capillary tube is then closed by melting it in the flame of the blow-pipe, and the bulb, thus filled with water, is again weighed. If from this last weight we subtract the weight of the glass, we shall have the weight

of the contained water. This bulb, with its known amount of water, is next placed in the glass globe *a*, the long tube screwed in its place, and the whole apparatus filled with dry mercury and inverted in a basin of the same metal. The mercury, of course, by its weight will descend from the glass globe into the tube, and sink until it becomes in *equilibrio* with the weight of the atmosphere, which, as we have said before, will be about the height of 30 inches. The inside of the globe will then be a Torricellian vacuum, and the water, if released from the small bulb in which it is contained, would immediately flash into vapor by the unbalanced repulsion of its atoms; and we can readily release them from their confinement by directing upon the bulb for an instant a beam of heat from the sun by a burning glass. By this means, the bulb will be broken, particularly if formed of dark glass, the water will be set free, and will be converted, in part at least, into vapor. The whole apparatus is then heated by plunging it into a water bath of which the temperature is gradually raised, or by heating the room in which the experiment is made, until all the water is converted into vapor. By carefully noting the temperature at which the liquid disappears, we have, from the previous table, the tension of the vapor at this point; and since the weight of the steam which fills the globe is equal to the weight of the water originally contained in the small bulb, we have the weight of the vapor, and knowing the number of cubic inches of the capacity of the globe, we can easily determine the weight of a cubic foot of vapor at the temperature at which the experiment was made.

Fig. 4



In this experiment care must be taken to determine always the exact temperature at which the water disappears; for if a portion of water remains in the liquid state we shall not have the true weight of the vapor; and we are assisted in determining this point by the fact that in gradually increasing the temperature of the apparatus we shall find that at the moment when all the water is evaporated the vapor will change its rate of expansion, and be governed by the same law as that of the expansion of dry air.

After having determined the weight of a given quantity of vapor, for example, a cubic foot, by direct experiment according to the method we have described, the weight of an equal quantity of vapor at other temperatures may be determined by calculation. For example, the density of the vapor, as in the case of air, will be in proportion to its elastic force, or the pressure to which it is subjected if the temperature remained the same; hence, from the table of elastic force already given, we may calculate the corresponding weights of a foot of vapor. The numbers thus obtained, however, must be corrected for the diminution of weight on account of the expansion due to increased temperature. In this way table *B* was constructed, in which the first column indicates the temperature of every tenth degree of Fahrenheit's scale: the second column gives the weight of

vapor in Troy grains contained in a cubic foot of space; the remaining columns give the weight of vapor at intermediate degrees.

B.—Weight of vapor, in grains Troy, contained in a cubic foot of saturated air. Temperature Fahrenheit.

DEGREES FAHRENHEIT.	Degrees Fahrenheit.									
	0°	1°	2°	3°	4°	5°	6°	7°	8°	9°
°	*Grains.*	*Grains.*	*Grains.*	*Grains.*	*Grains.*	*Grains.*	*Grains.*	*Grains.*	*Grains.*	*Grains.*
0	0.545	0.569	0.595	0.621	0.649	0.678	0.708	0.739	0.772	0.806
10	0.841	0.878	0.916	0.957	0.999	1.043	1.090	1.138	1.190	1.243
20	1.208	1.355	1.415	1.476	1.540	1.606	1.674	1.745	1.817	1.892
30	1.969	2.046	2.126	2.208	2.292	2.379	2.469	2.563	2.659	2.759
40	2.862	2.967	3.076	3.180	3.306	3.426	3.550	3.679	3.811	3.948
50	4.089	4.234	4.383	4.537	4.696	4.860	5.028	5.202	5.381	5.562
60	5.756	5.959	6.154	6.361	6.575	6.795	7.021	7.253	7.493	7.739
70	7.992	8.259	8.521	8.797	9.081	9.372	9.670	9.977	10.292	10.616
80	10.949	11.291	11.643	12.005	12.376	12.756	13.146	13.546	13.957	14.378
90	14.810	15.254	15.709	16.176	16.654	17.145	17.648	18.164	18.693	19.235
100	19.790	20.357	20.933	21.535	22.145	22.771	23.411	24.069	24.742	25.429

This table, we shall see, is of great importance in practical meteorology, by enabling us to ascertain the weight of the vapor in a given portion of the atmosphere at different temperatures.

The latent heat of vapor.—There is another circumstance in regard to vapor which is of essential importance in understanding the part which it plays in producing the diversified changes of the weather, namely, the great amount of heat which it contains at different temperatures. It is well known that the quantity of heat that a body contains is not actually measured by the thermometer or the temperature which it exhibits; for example, if a cubic foot of air at 60 be expanded without receiving or losing heat, its temperature will be much diminished, because the same amount of heat which was before contained in a given space is now distributed through a larger space. If an ounce of steam from boiling water, which indicates a temperature of 212°, be condensed in water at 60°, it will give out to the latter enough heat to elevate six times the quantity of water to the boiling temperature; that is, six times as much water through 152°, or the same amount of water 912°; or, in other words, after having given out more than 900° of heat in the act of being converted from a vapor to a liquid, it still retains a temperature of 212°. The heat which is thus set free, and has not been recognized by the thermometer, is called *latent heat.* In thus condensing a given quantity of vapor, from water at different temperatures, in a given quantity of cold water, and noting the elevation of temperature of the latter, it has been shown by Dr. Dalton and others that an ounce of vapor at all temperatures contains very nearly the same amount of heat, adding the latent and sensible heat together.

This constancy of the amount of heat arises from the fact, that as we increase the thermometric heat a new portion of vapor is forced into the same space, its density increases, and the amount of latent heat is diminished; hence if the attenuated vapor from ice were

received in a syringe, and suddenly condensed until its density became equal to that of boiling water, its temperature would be 212°.

On account of the great amount of latent heat of vapor, heat must be absorbed from all surrounding bodies during the process of evaporation; and in all cases of the reverse process; that is, of the conversion of vapor into water, an equal amount of heat must be given out. This absorption of heat by vapor at the place of its formation, and the evolution of an equa. amount at the place where it is condensed into water, is one of the most efficient means of varying the temperature of different portions of the earth from that which they would naturally acquire under the regular periodical variation due to the changes of declination of the sun.

In the evaporation of a cubic foot of water it is known from experiment that an amount of heat is absorbed equal to that evolved from the combustion of 20 pounds of dry pine wood, and consequently every cubic foot of rain water which falls from the clouds leaves in the air above an equal amount of extraneous heat, which tends to abnormally raise the temperature due to the elevation, and to produce powerful upward currents *above*, and horizontal motions of the air below. We may also recall in this place the fact that water, in passing from the state of ice to that of a liquid, absorbs 140° of heat, which is again evolved in the act of freezing, and that this also is an efficient means by which colder portions of the earth are mollified in temperature.

In the explanations we have thus far given we have spoken of the increase of the repulsion of the atoms of water by an increase of heat. By this we mean the increased tendency which they have to separate from each other with a force which resembles simple repulsion, but which, if we adopt the vibratory theory of heat, will be due to the increased intensity of the oscillation of the particles. We have also employed the usual term latent heat to express the heat which disappears when a solid is converted into a liquid, or a liquid into a vapor—though this, according to the new theory of heat, would be expressed by the quantity of vibration, or mechanical energy, which is absorbed in the change of state of the body, and which will re-appear when the reverse process takes place. To illustrate this, suppose an impulse be given to a body upward sufficient to throw it upon a shelf. In this case we may consider the mechanical energy as having been expended in producing this effect, although it is ready again to make its appearance and to do work when the ball is suffered to fall again to the level whence it was projected.

Vapor in air.—We are also indebted to Dr. Dalton for another important series of experiments, which relate to the mingling of air and vapor. In the experiments before given the vapor was weighed, and its temperature and tension determined in a separate state and unmingled with the air. To ascertain the effect which would be produced on the tension of vapor when suffered to be exerted in a space already occupied with air of different densities, Dr. Dalton employed the same method of experimenting previously described. A barometer tube was filled and inverted, as before, in a basin of mercury,

a quantity of air was then admitted, which, rising into the Torricellian vacuum, pressed by its elasticity on the surface of the mercury and caused it to descend a given number of divisions of the scale, which were accurately noted; a small quantity of water was next admitted, which, rising to the top of the mercurial column, was, after a few moments, in part converted into vapor, while the mercury was observed to be depressed. When the experiment was repeated with different quantities of air above the mercurial column and at different temperatures, produced by varying the heat of the water in the external tube, or, which would amount to the same thing, by varying the temperature of the room, the remarkable fact was discovered that the depression of the mercurial column, due to the introduction of the water, was precisely the same at the same temperature as when the experiment was made with a vacuum; for example, at the temperature of 60°, whatever might be the elasticity of the air within the tube, the introduction of the water always gave an additional depression of half an inch. From this result the important fact is deduced, that the tension or elastic force of vapor in air is the same as that of vapor in a vacuum; from which we might also infer that the quantity of vapor which can exist in a given space already occupied with air is the same as that which can exist in a vacuum at the same temperature. But this fact may be directly proved by an independent experiment. For this purpose let the globe *a*, Fig. 3, be filled with air, while the small bulb, placed within, contains a known quantity of water, and let the globe thus filled be screwed to the top of the barometer tube. If the apparatus be now partially filled with mercury, so as to leave the globe nearly filled with air, and the whole inverted with its lower end in a basin of mercury, the mercury will descend along the scale, and will come to rest at a certain division which will indicate the elastic force of the air in the globe; if next the stop-cock be shut, and the small ball be broken by the heat from a burning glass, the contained water will, in part at least, spring into vapor; and if we gradually heat the globe until all the water disappears, and note the temperature at which this takes place, the globe at this moment will be filled with air at a known density, and with invisible vapor of a known weight and temperature. If we now calculate from the table *B* the amount of vapor which at this temperature existed in this globe while its interior was a vacuum, we shall find it precisely the same as the weight of that which the globe now contains when filled with air. If, for example, the globe be a foot in capacity, and the small bulb contain 9.37 grains of water, the temperature at which the water disappears being 75°, by passing our eye horizontally along the table we shall find under 75° the same number of grains. This experiment conclusively proves that the same amount of vapor can exist in a space already filled with air as in a vacuum. The repulsive atoms, however, of each will be exerted against the sides of the vessel, and the resulting pressure will be the sum of the two; a fact which is proved by noting the height of the column *B*, which indicates the elastic pressure of the air in the globe before the vapor was admitted, and which, for example, we may suppose to be equivalent to the weight of 20 inches of mercury.

If we now open the stop-cock the mercurial column will be depressed by the additional repulsion of the atoms of the vapor of water, and if the temperature be at 75°, (as we have previously supposed,) the depression will be 0.867 inches.

The same result may be obtained by the following method, which also gives us an independent means of determining directly the amount of vapor which exists in the atmosphere at a given time, and which may be employed for verifying the results obtained by other means. Let a tight cask, furnished with a stop-cock near its lower part, be entirely filled with water, and let the small end of a tube, which has been drawn out in a spirit lamp, be cemented into the vent-hole above, so that no air can enter the cask except through the tube. Let this tube be filled with coarsely powdered dry chloride of calcium—a substance which has a great affinity for moisture—and the upper end put in connection with an open vessel containing air entirely saturated with moisture, which can readily be effected by agitating a quantity of the liquid in the vessel from which the air is drawn; let the stop-cock be now opened, and exactly a cubic foot of water be drawn into a measured vessel, it is evident that precisely a foot of air will enter the top of the cask through the tube and between the interstices of the pieces of chloride of calcium, the moisture will be absorbed and its weight can be accurately ascertained from the increase of weight of the tube and its contents, which had previously been weighed for that purpose. By this simple experiment, as well as by the one we have previously given, we are enabled to conclusively prove that the weight of vapor contained in the air in a given space is the same as that which would exist at the same temperature in a vacuum. To render, however, the result of this experiment absolutely perfect, a slight correction must be made on account of the expansion of the air and the vapor due to the increased repulsive energy of the compound over that of the air itself. This will be evident from a due consideration of what follows.

If into an extensible vessel, such as an India-rubber bag filled with air, a little water be injected, the bag will be suddenly expanded by the additional repulsive force of the atoms of vapor. Previous to the introduction of the water, the bag will be pressed equally on the outside and on the inside; on the former by the weight of the external atmosphere, and on the latter by the repulsive or elastic force of the atoms of the inclosed air; when the water is introduced and a portion of it springs into vapor, the elastic force of the aqueous atoms must be added to that of the atoms of the air, and the interior will then be pressed outward with a force equal to the sum of the two repulsions. For example, if the experiment be made at 60° and the air at its normal weight, the outward pressure within the bag previous to the introduction of the water will be equal to 30 inches of mercury, but after the water is injected it will be 30 inches and a half; hence, expansion will take place and the bag will be distended until, by the separation of the interior atoms, the repulsion is so much weakened that the pressure without and within will again be equalized. The amount of the increase in bulk will be given by the

following proportion: as the pressure of 30 inches of mercury is to the pressure of 30½ inches, so is the original bulk of the India-rubber bag to its bulk after the introduction of the vapor.

From the preceding experiments and observations it is evident *that in free air the vapor exists as an independent atmosphere, being the same in weight and in tension as it would be in a vacuum of the same extent and of the same temperature.* That the same amount of vapor can exist in a space filled with air as in a vacuum at first sight appears paradoxical, but when we consider that a cubic inch of water expanded into steam at 212° occupies nearly 1,700 times the bulk which it does in the form of water, also that air may be compressed into a space many hundred times less than that of its ordinary bulk, it is evident that the extent of the void spaces is incomparably greater than the atoms themselves, and, consequently, it is not difficult to conceive that the atoms of the vapor have abundance of space in which to exist between the atoms of air and the atoms of air between those of vapor. Dr. Dalton announces this important truth by stating that air and vapor and almost all gases are vacuums to each other. This enunciation is a true expression of the state of diffusion which gases and vapors attain after the lapse of a given time, but it does not truly express the phenomena of the act of diffusion. In a perfect vacuum a given space is filled with vapor almost instantaneously, or with a rapidity which has not yet been estimated, but this is not the same in a space already filled with air. In this case, though the vapor ultimately diffuses itself through the air as it would in a vacuum, yet time is required to produce this effect; the result is as if there were a mechanical or some other obstruction to the free passage of vapor through the different strata of air, and, indeed, it would appear from the following experiments that a definite force, similar to that produced by a slight attraction or repulsion, is offered in the resistance of a given thickness of this medium: In the laboratory of the Smithsonian Institution, a glass tube of about 3 feet in length, closed at its lower end, suspended vertically, and containing about an inch of water, has remained for several years undisturbed in this condition, without the least perceptible diminution in the amount of the liquid. In another experiment, a pane of glass was removed from an external window of a room and the place of the glass supplied by a board, through the middle of which a hole of about an inch in diameter was made, and in this opening a tube was placed horizontally, one end being in the room and the other in the outer air. To each end of this tube a glass bulb was attached, air tight, the one within the room containing about an ounce of water, while the tube and the bulb on the outside were occupied with air. The temperature of the air within the room was, on an average, about 70°, while that of the air without was, on an average, nearly 32°, and although the experiment was continued for several months during winter not one drop of water was distilled over into the outer bulb. When, however, the latter was surrounded by a freezing mixture, a small quantity of vapor did pass over and was condensed into water; and also when the vapor

in the outer bulb was absorbed by introducing a quantity of strong sulphuric acid into this bulb, the water in the other bulb gradually diminished in weight.

From these experiments it would appear that there is more than a mechanical obstruction to the transfusion of vapor through air, and that if the difference of tension of vapor in two vessels only amounts to a certain quantity, no transfusion from one will take place to the other, or, in other words, for each inch or foot of thickness of a stratum of air, a certain amount of unbalanced repulsive energy is required for transfusion. The rapid mingling of vapor with air is due, in a considerable degree, to the currents produced by the mixture itself, and by variations of temperature.

From an application of the principle we have given relative to the co-existence of vapor and air, we are able by means of tables *A* and *B* to ascertain immediately by inspection the amount of vapor and its tension which exists at any time and in any place in a foot of air perfectly saturated with moisture, that is, which contains as much vapor as it can hold at the given temperature. If, for example, the temperature of the saturated air be 75°, we would find opposite this, in the table *B*, the weight of 9.372 grains; and by merely knowing the temperature at other times and at other places we would be able to determine the relative quantity of the vapor under these different circumstances, and to form a judgment as to the dryness or humidity of different localities; but since there is a constant resistance to the diffusion of vapor through the atmosphere, it follows that the air is seldom at any time or in any place entirely saturated. It is, on the contrary, in the condition of air filling a vessel, into which less water has been injected than that necessary to furnish sufficient vapor to fill the interstices between the atoms at the given temperature.

We have been provided, however, by Dr. Dalton, with a very simple process by which the amount of vapor in a given portion of air which is not saturated can be determined. For this purpose it is only necessary to procure a bright metallic tumbler, the thinner the sides of which the better, and partially filling this with water at the temperature of the air, and gradually adding colder water, stirring the mixture all the while with the bulb of a delicate thermometer, note the temperature at the moment when dew begins to be deposited on the outside. This temperature is called the dew-point, from which we determine by the tables the tension and the amount of vapor in the surrounding atmosphere. To render this clear, suppose the amount and tension of vapor in the atmosphere to be that which would be produced by a temperature of 60°, the temperature of the air at the time of the experiment being 70°, the atmosphere in this case would not be saturated; but if we should gradually cool it down to the temperature of 60° it would *then* be saturated, and the least diminution of temperature below this degree would cause a precipitation of vapor in the form of mist or dew, and this is what really takes place in regard to the vapor which immediately surrounds the sides of the tumbler. The introduction of cold water into the tumbler cools the surface, which in turn cools the air immediately around it,

and when the diminution of temperature reaches the point at which the air is just saturated the dew makes its appearance. Hence when the sides of the vessel are very thin the temperature noted by the thermometer within gives that of the dew-point without, and if with this temperature we inspect the table, we find at once the corresponding tension and weight of vapor in that portion of the atmosphere in which the experiment was made.

It is not, however, upon the actual amount of vapor which the air contains at a given time or place that its humidity depends; but upon its greater or less degree of saturation. That air is said to be dry in which evaporation takes place rapidly from a surface of water or moistened substance. In an atmosphere entirely saturated with vapor, that is, in one which is filled with as much vapor as the space which it occupies can contain, the vapor already in the air by its elastic force presses on the surface of the moist body and neutralizes the repulsive action of the water; if, however, the temperature be raised, the elastic force will be increased and a new portion will be forced into the same space; the further, therefore, the condition of any portion of air is from saturation the more rapid will be the evaporation from the moist bodies which it surrounds.

For example, a portion of air at a temperature of 100° would contain vapor of an elastic force, were it entirely saturated, equal to a pressure of 2½ inches of mercury. If the same air, however, only contained vapor of the elastic force of 60°, or, in other words, if the dewpoint was at 60°, the elastic force would be half an inch, and consequently there would be a force unbalanced by the pressure of vapor equal to the pressure of a column of 2 inches of mercury. The dryness, therefore, of the air is estimated by the difference of the elastic force of the vapor due to the temperature of the air, and of the elastic force due to the tension of the dew-point.

In meteorological works generally, when a portion of the atmosphere contains vapor equal in tension to that of the temperature of the air, it is said to be, as we have before observed, fully saturated, and its humidity is marked 100; but if the elastic force of the air as determined by the dew-point is only one-fourth of that necessary to produce complete saturation, the relative humidity is marked 25. To find, then, the relative humidity at any time, we seek from the tables the tension of vapor due to the temperature of the air, and again due to that temperature to which it must next be cooled down in order to produce precipitation, or full saturation, which temperature, as we have seen, is that of the dew-point. We then say, *as the tension of the first temperature is to* 100, *so is the tension of the other temperature to the per-centage of saturation.* In this way comparative tables of relative humidity for different places are calculated from actual observation.

Instead, however, of employing the method of the dew-point for ascertaining the quantity of vapor in the atmosphere, a process which is attended with some difficulty, particularly in cold weather, since in this case it is not easy to reduce the temperature of the water

within the tumbler except by a freezing mixture sufficiently low to produce the deposition of dew, another process has been employed, called that of the wet and dry bulb thermometer.

In this process, we note the temperature of the air by an ordinary thermometer, and again we observe the temperature to which in the same place a thermometer of which the bulb is covered with muslin and wet with water descends. If the air is perfectly saturated with moisture the two thermometers will indicate the same degree; but if the temperature is above that due to the elastic force of the actual amount of vapor in the air the evaporation from the moist bulb will cause it to descend, by the absorption of heat, a certain number of degrees below that indicated by the naked bulb.

M. Regnault has compared by direct experiment, according to the method we have explained, page 435, the indications of the wet and dry bulb thermometer with the actual amount of vapor contained in air at different temperatures and at different degrees of saturation, and has in this way formed a series of tables by which the dew-point, the tension of the vapor, and the weight in a cubic foot can be ascertained. In order, however, that the indications of this instrument may be relied upon, it is necessary that the observations be made with care, since the evaporation from the wet bulb will very much depend, as we shall presently see, upon the motion or stillness of the air; and, indeed, we think that in all cases, in order to obtain comparable results, the bulb should be fanned, so as in every instance to give the same amount of agitation to the surrounding medium. This will be evident, from what we have said of the slow diffusion of vapor of feeble tension in the atmosphere. A local atmosphere of vapor is soon formed around the bulb, which very much impedes evaporation and consequently the reduction of temperature.

Evaporation of water.—Water is constantly evaporated from the surface of the ocean; the amount, however, diminishes as we proceed from the equator towards the poles. It is also exhaling from the surface of the earth, but in less quantities. The daily, monthly, and yearly amount of evaporation from a given surface of water and different kinds of earth is one of the most important data in reference to engineering and agriculture which can be furnished, and we would commend the research in reference to it to the special attention of any person who can command the time and desires an opportunity of advancing our *knowledge* of the operations of Nature. A series of experiments on the evaporation from water may be made by carefully noting the quantity which disappears daily from a surface of a square foot freely exposed to air and sunshine. The depth of the box, which may be of tin encased in wood, should be 6 inches, and the amount of water measured by a screw, the lower end of which tapers to a point, and on the upper end a divided circle is placed, so marked that the tenth part of the width of the screw or the one-thousandth of an inch may be estimated. Care should be taken to guard this surface from rain, and in high wind to estimate the amount of water which may be blown out; the latter may be approximately found by surrounding the evap-

orating vessel with a border of grey paper, on which each drop of escaping water will make a stain; the number and size of these spots being known, the amount of water blown out may be estimated from the result of previous experiments in which the known quantity of the fluid has been sprinkled over the same surface. It is well, in order to make certain corrections, to observe the average temperature of the water during the day, and for this purpose a bulb of a thermometer is placed just below the surface of the liquid. In ascertaining the evaporation from different kinds of soil, a number of boxes, of the same dimensions we have described, should be filled with different samples supplied with a sufficient quantity of water, weighed from day to day, and the loss, which will give the evaporating capacity, accurately noted. To ascertain the amount of evaporation from the actual surface of the earth in the course of the year, the loss from a new portion of earth with which the box is filled taken from the surface in its actual condition should be daily determined.

The annual amount of evaporation from a given surface of water in the interior of the country is greater than that of the rain which falls on the same surface, but the amount of evaporation from the surface of ground is generally less, particularly in mountainous districts.

The evaporation does not depend upon the position of the evaporating surface, since a piece of moist paper pasted on a pane of glass loses the same amount of water in the same time, whether it be held horizontally or vertically. It does, however, depend very much upon the nature of the surface; for example, less must be given off in a given time from a surface of salt water than from a surface of fresh water; and also, from the cohesion with which water adheres to solids, a less amount of vapor is produced in a given time from a given surface of moist earth than from water, as is shown by the following table, deduced from observations made by M. Gasparin, in France, at temperatures from 73° to 75°, during the month of August:

DATES.	Evaporation from water.	Evaporation from earth.
	Inch.	*Inch.*
1st day of August	0.575	0.160
2d......do	0.534	0.098
3d......do	0.448	0.070
4th.....do	0.468	0.051
5th.....do	0.456	0.051
6th.....do	0.429	0.047
7th.....do	0.367	0.051

The surface of the earth in this experiment was at first completely soaked with water.

It is evident, on account of the slowness with which vapor diffuses itself through still air, that a much greater evaporation will be produced during a brisk wind, particularly if it be from a dry quarter, than during calm weather. If the vapor which is formed is allowed to accumulate over the evaporating surface, it will by its reaction

retard the free ascent of the other portions of vapor; but if it be constantly removed as fast as it is formed, the process will evidently go on more rapidly.

Vapor, as we have seen, contains a large amount of latent heat, and water cannot be converted into an aeriform state without the supply of the necessary quantity of this principle. Hence the higher the temperature, or the more freely the evaporating surface is supplied with heat, the greater will be the amount of vapor in a given time.

We have seen that water immediately flashes into vapor in a vacuum, and we might infer from this that the rarer the air, or the more nearly it approximates to a void, the less obstruction would it offer to the free production of vapor, and the correctness of this inference has been satisfactorily shown by direct experiment.

We owe to Dr. Dalton a series of precise experiments on the evaporation of water in air of different degrees of dryness and at different temperatures. He employed in his investigations a circular dish or pan, 6 inches in diameter, about an inch deep, and suspended from the beam of a balance, by which the loss of water could be accurately ascertained from the variations of the weight in a given time. With this instrument he made a series of experiments while the air contained different quantities of moisture, the amount of which was ascertained by means of the dew-point method we have before described, in a perfectly still place, and with the apparatus exposed to a rapid draught of air. At the boiling point the evaporation in still air was 120 grains in a minute; in a gentle wind, 154 grains; and with a strong wind, 189 grains. A similar difference existed at the evaporating temperature of 60°: in still air the evaporation was 2.1 grains in a minute; in a gentle wind, 2.7; and in a strong wind, 3.3. From all the experiments he deduced the important result that the amount of evaporation in all cases is proportional to the difference of the elastic force of the temperature of evaporation and that of the dew-point or the vapor actually in the air.

The empirical rule deduced from his table of results will serve approximately to calculate the amount of evaporation under the different conditions of temperature, dryness, &c., of the air, the temperature of the evaporating surface and that of the dew-point being known. For still air, multiply the difference of the tension of vapor due to the temperature of the evaporating surface, and of the vapor in the atmosphere, by 4, and this will express in grains the weight of the vapor given off from a circular surface of water of 6 inches in diameter in one minute of time. If a gentle wind be blowing, multiply the same difference by 5, and if a high wind exists during the experiment multiply the same difference by 6. If, for example, the temperature of the evaporating surface be at the boiling point, and the temperature of the dew-point be 60°, we shall have 30 inches, the tension of the evaporating surface, and 0.5 for that of the tension of the vapor in the atmosphere at the time, the difference will be 29.5, which, multiplied by 4, gives 118 grains. Again, if the temperature of the evaporating surface be 90, and that of the dew-point 70, then we

shall have $1.4 - 0.7 = 0.7$. If we suppose a gentle wind blowing at the time this must be multiplied by 5, and we shall have $0.7 \times 5 = 3.5$ grains as the amount of evaporation per minute from a circle of 6 inches in diameter.

The formula of Dr. Dalton, in the absence of other data, may be considered a valuable approximation; still results derived from direct observations in different parts of the earth, as we have said before, are desiderata of great value.

Physical effects of evaporation and of vapor in the atmosphere.—Before considering the more important meteorological changes produced in the general condition of the atmosphere by the vapor which it contains, we may discuss some of the minor physical phenomena connected with the process of evaporation and the existence of water in an aeriform condition.

Heat and moisture are the principal essential atmospheric agents in the production of vegetable matter, and where these are not found in sufficient quantities, however rich may be the soil in fertilizing materials, at least comparative if not absolute sterility must prevail. Unfortunately, however, these conditions, though so highly favorable to the production of the substances which administer to the necessities and conveniences of life, are not equally favorable to the condition of health of the more highly civilized races of men. Heat and moisture are also the essential conditions under which the deadly malarious effluvia exert their baneful influence, and though science may hereafter furnish the means of disarming these of their terrors, yet at present they oblige the white man to reap the rich harvests of fields, which would otherwise be uncultivated, by the labor of individuals of another race, so different in their physical organization as to be entirely exempt from the effects of these aerial poisons. The fertile rice, cotton, and sugar fields of the southern portion of the United States, the attempt to cultivate which by the white man would be fatal, are worked by negroes not only with impunity, but with the comforts and the physical enjoyments of life.

The relative moisture of different countries is intimately connected with their condition as to healthfulness. While in the moist climate of Great Britain, and that of some of the West India islands, diseases of the lungs are prevalent, they are seldom known in the dry regions of Nebraska and Minnesota.

From the experiments of Dr. Dalton, as we have seen, the rapidity of evaporation is proportional to the difference of elastic tension of the vapor in the air and that of the evaporating surface. Meteorologists have generally adopted, as the expression of relative humidity, the ratio of the force of vapor in the air to the force which it would have were it perfectly saturated, or they sometimes adopt an equivalent expression, by defining the relative humidity to be the ratio of the absolute quantity of vapor which the air could contain at the given temperature, to that which it actually contains. According to this definition two places would be equally damp which are both half saturated with vapor, though the abstract quantity of vapor in the

one case may be many times that of the other. Thus in winter when the temperature is very low and the absolute quantity of vapor in the air is exceedingly small, the air may have a maximum of dampness, or, in other words, a very great relative humidity. Although this method of establishing the relative humidity of different places may correspond with variations in different phenomena, yet there are some effects which appear to depend not on the relative but on the absolute amount of humidity in the air. The conducting power of electricity, for example, appears to increase with the absolute amount of vapor in the air, and hence experiments with the electrical machine succeed much better in winter than in summer, though the relative humidity in both cases may be the same. Again, since the temperature of our bodies is 96°, and as this may be regarded as the temperature of an evaporating surface, the difference of tension of vapor from the pores of the skin and that in the air must be very different in winter and in summer; and hence in the latter case, when the dew point approaches the temperature of the body we experience the sensation of the closeness and sultriness of the atmosphere.

On the other hand, the intense cold which is felt on the Western plains in winter is due principally to the rapid evaporation from the pores of the skin—a result which can only be guarded against by a covering of close texture, such as the prepared skins of animals. In this connection, we may mention a fact, which, at first sight, might appear to militate against the usages of civilized and refined life, namely, that dirt and grease are great protectors of the skin against inclement weather, and therefore, says Mr. Galton, "the leader of a party should not be too exacting as to the appearance of his less warmly clad followers." Daily washing, if not followed by oiling, must be compensated by warmer clothing. A savage never washes himself in cold weather unless he can give himself a clothing of grease. The tendency to evaporation from the skin during high winds must be opposed by a substance which will partially close the minute orifices. Warmly clad and protected from the cold of winter, the civilized man can enjoy the luxury of washing which is denied to the naked savage.

Among other effects of evaporation connected with its reduction of temperature should be mentioned the advantages derived from draining marshy soil by the diminution of the lowering of temperature due to the evaporation of the surface water. It is said that the mean temperature of certain parts of England has been perceptibly increased by the general introduction of this system of agricultural improvement.

The moisture of the atmosphere often affects our health and comfort by its deposition on the walls and other parts of our habitation. It is imbibed with great force and in large quantities by the pores of almost every substance, and is given out again when a change in the temperature or dryness of the air occurs. Building stone and brick absorb a large amount, which may be transmitted by capillarity from without, through a wall of considerable thickness, and evaporated at the interior surface. The dampness, however, of a stone house is not principally due to this cause, but to the deposition of moisture

from the air on the cold surface of the wall—precisely analogous to the formation of dew on the surface of a pitcher containing cold water.

If during a spell of cold weather an apartment of a stone house has been closed, and on the recurrence of a warm day the windows are opened to air the room, the deposition we have mentioned takes place in abundance, and the result intended to be guarded against is promoted rather than diminished. If a fire be made in the room previous to opening the windows, so that the sides of the apartment may be made warmer than the air, the deposition will not take place. The effects both of the transmission and of the deposition of moisture can in a great measure be obviated by the means now generally adopted of lining the interior of the room with a thin coating of a non-conducting material separated from the wall by a stratum of air. The surface of this material readily assumes the temperature of the air, and therefore does not allow of the deposition of much moisture. This internal lining, known by the name of furring, is usually composed of lath and plaster, but in some large buildings it is formed of a single thickness of brick, which prevents transmission of moisture from without, but does not fully obviate the tendency to deposition within, since a large amount of vapor is absorbed through the pores of the coating of plaster into the substance of the brick, and again given out with a change of temperature.

The dampness of newly-plastered walls is in part due to a chemical action, which, paradoxical as it may appear, is not obviated by heating the wall. After a newly plastered room has been dried by an excess of artificial heat, it continues for a long time to give off vapor, and this is due to the chemical change going on while the lime in the plaster is in the process of being converted from what is called a hydrate to a carbonate of lime. Perfectly dry slacked lime contains in chemical combination a portion of water, and when it is exposed to the atmosphere it absorbs carbonic acid from the air and expels the water in the form of vapor; hence, after a plastered wall has been thoroughly dried it ought to be exposed freely to currents of air, which may furnish the carbonic acid necessary to expel what may be called the solid water, or that of chemical combination.

The water which is absorbed into the pores of stone by capillary attraction does not change its dimension. Mr. Saxton, of the Coast Survey, has shown that a rod of marble of 3 feet in length is not increased the ten-thousandth part of an inch by soaking it in water from a state of perfect dryness produced by heating it in an oven. The experiment was made on the marble of the Capitol, at the request of Captain Meigs, the superintendent of the extension of that national edifice. The absorption, however, of moisture by organic substances produces a change in their dimensions, which takes place with the exhibition of great force. The water is absorbed in great quantities at the ends of the fibres of wood, and the principal expansion takes place in a direction at right angles to these fibres; it is also absorbed laterally between them, though in a less quantity. The warping of furniture is simply due to the exhalation of the water in the form of vapor from the pores of the wood. and the consequent shrinking of

the part from which the exhalation has taken place, while the other parts retain their original bulk. To prevent this, it is necessary to imprison the vapor by a coating of an impervious substance, such as varnish or paint; or, what is still better, to expel the moisture by baking the wood and subsequently filling its pores with some resinous substance. It is important, however, to observe that when a substance is to be protected from moisture by a covering of paint or varnish, care should be taken to cover every part with the impervious mixture; for the moisture may be drawn in through even a nail hole, and pervade the whole interior capacity of the wood.

Various instruments for indicating the moisture of the atmosphere without accurately measuring its changes have been constructed upon the principle of the absorption and consequent change of dimensions of different substances. An instrument, which has lately been very widely described in the newspapers under the erroneous name of a simple barometer, is composed of two shavings of light wood, glued together so as to make a ribbon of double thickness; the fibres of one layer being at right angles to those of the other. The absorption of the moisture into the shaving in which the fibres are lengthwise, tends merely to increase the width and not the length of the compressed ribbon, while the absorption of moisture into the shaving of which the fibres are transverse tends to increase the length of the ribbon, and thus causes it to curl. The foregoing instrument belongs to the class denominated hygroscopes, intended simply to indicate the changes which take place in the vapor in the atmosphere without furnishing the means of measuring its precise amount. For this purpose, various substances are employed, such as a stretched cord, a human hair deprived of oily matter by washing it in ether, and the beard of the wild oat; the change in length of the first two and the twisting of the latter furnish the indications required.

Different materials absorb moisture in different degrees; a fact which is evident in passing along the sidewalk of a street at the beginning of a rain. While some of the bricks of which the pavement is composed are entirely wet at the surface, others appear dry, because the water which has fallen upon them has been absorbed. It is scarcely necessary to add, that after perfect saturation has taken place, and the surface is exposed to the heat of the sun, the appearance of wetness is exhibited in a reverse order. The relative absorptive power of different materials is frequently a matter of considerable practical importance, which can be readily ascertained by weighing equal bulks of the material previously dried in an oven, and again after having been thoroughly soaked under the pressure of several feet of water. The absorption of water and its subsequent expansion by freezing is the most efficient agency in the gradual destruction of the architectural monuments by which the ancients sought to impress upon the future a material evidence of their power and wealth.

Constitution of clouds.—Water in the state of vapor, as we have stated, is perfectly transparent, and this may be conclusively proved, even of steam at a high temperature, by boiling water in a glass vessel with a long neck, or by fastening a glass tube to the spout of a tea kettle.

The vapor within the glass will be entirely invisible, and that peculiar condition called *cloud* will not be assumed till the transparent steam mingles with the cooler atmosphere and is partially condensed. The appearance of a cloud is also produced if a portion of transparent air is suddenly cooled, either by expansion or mingling with a portion of air of a lower temperature. Much speculation has arisen in regard to the nature or condition of water when in the intermediate state of cloud, and, though the subject has occupied the attention of scientists for more than a century, it is still not fully settled.

Saussure, the celebrated Swiss meteorologist, states that, in ascending the sides of a mountain into the region of the clouds, he has seen globules of water as large as small peas floating in the air, which, from their levity, were evidently hollow spheres, similar to small soap bubbles. From this observation the idea became prevalent that the water of a cloud was in a vesicular condition, or, in other words, that cloud consists of minute hollow spheres of liquid water, filled with air, which is rendered more buoyant by the rarefaction due to the heat of the sun; and this opinion was strengthened by the fact that clouds do not give a decomposition of the rays of light sufficient to exhibit the phenomena of the rainbow. In what manner such a condition of water can be produced, and how it can be retained by any principle of science, has not, so far as we are informed, been explained. A soap bubble soon becomes too thin to retain its globular form, and is resolved into the condition of soap water. Ordinary water is still more unstable, and cannot be retained for an instant in a hollow spherical form. We shall therefore be on the safe side if we adopt an hypothesis apparently more in accordance with known and established principles, and, if this does not furnish a logical account of all the phenomena, we must wait until further research, or light from collateral branches of science dispels the obscurity with which this point may be involved.

The suspension of the clouds can be explained by taking into account the extreme minuteness of the particles of which they are composed. In the case of mists, which are sometimes formed at the surface of the earth, and afterwards become clouds in being elevated into the atmosphere by a wind blowing between them and the earth, the particles are of such extreme tenuity as to be invisible to the naked eye, and their presence is only rendered evident by looking through a stratum of considerable thickness.

If particles of lycopodium or the seeds of the puff-ball are dusted upon a flat glass, they exhibit a series of colors, when held between the eye and the light, produced by the interference of the waves of different rays of light. In order to produce this effect, as it can be proved mathematically, the particles of lycopodium must not exceed a thousandth of an inch. Now, the particles of a cloud are sometimes known to present the appearance of similar colors, and, therefore, are not larger than those of the lycopodium. This extreme minuteness is sufficient to account for the suspension of clouds, or the extreme slowness with which they descend. M. Maille, of Paris, has attempted to compare the volume of a particle of this size with that

of a drop of rain water of about a tenth of an inch in diameter. He finds that it would require upwards of 200,000,000 of particles of cloud to make one drop of rain water of the size we have mentioned. We have not repeated the calculation, but are prepared to admit the correctness of the conclusion, when we reflect on the rapid increase of the volume of a sphere relative to the increase of its diameter. For example, if a series of spheres have diameters in the ratio of 1, 2, 3, 4, 5, 6, the volumes or weights of the spheres, provided they are of homogeneous material, will be represented by the numbers 1, 8, 27, 64, 125, 216. Indeed, nothing is more deceptive than the estimate we form of the relative volume or weight of different solids by simply comparing their diameters. It requires but a very small increase in the diameter of an egg, for example, to double its weight. We know that the resistance of the air to the descent of a falling body is in proportion to the surface which it presents to the resisting medium. Now, every time a drop of water is divided a new surface is exhibited, and, when the division is carried as far as that of the particles of cloud, the resistance must be so great that an indefinite length of time must be required to produce a descent of a few hundred feet.

The process of the formation of clouds will be described in a subsequent section; we may here, however, mention that the forms and aspects in which they are presented are indicative of the circumstances in which they are forming or dissipating, and hence the importance of giving special names to these forms in order that they may become objects of definite study. The first attempt at a descriptive classification of clouds was by Mr. Luke Howard, in 1802. An account of this is given in all works on meteorology, and we need here only give a brief exposition of his nomenclature. He divides clouds into three primary modifications: cumulus, stratus, and cirrus, with intermediate forms passing into one another under the names cumulo-stratus, cirro-stratus, cirro-cumulus; and, lastly, a composite form, resulting from a blending or confusion of the others, under the name cirro-cumulo-stratus or nimbus.

1. *Cirrus*, consisting of parallel or diverging fibres, extended by increase of material in any or in all directions.

2. *Cumulus*, convex or conical masses, increasing upward from a horizontal base.

3. *Stratus*, a widely extended continuous horizontal sheet.

4. *Cirro-cumulus*, generally known as mackerel sky, consisting of small rounded masses, disposed with more or less regularity and connection.

5. *Cirro-stratus*, consisting of horizontal or slightly inclined masses, undulating or separating into groups, giving the idea of a shoal of fish in the distance.

6. *Cumulo-stratus* consists of a blending of the cirro-stratus with the cumulus.

7. *Nimbus* is the cloud from which a continued rain falls.

A drawing of these different forms of clouds will be found in the

instructions for meteorological observations, published by the Smithsonian Institution.

Dew and hoar frost.—When a mass of moist air is brought in contact with a cold body its vapor is condensed into water and deposited in minute globules on the cooled surface, which constitute dew. If the temperature of the surface is below the freezing point the globules of water will be frozen into minute crystals of ice, which constitute hoar frost. For a long time the nature of these phenomena was entirely misconceived; the effect was put for the cause, the dew being regarded as producing the chill which accompanies its formation, instead of the reverse. Dr. Wells, of London, born in South Carolina, was the first who gave the subject a scientific investigation, and, by a series of ingenious, accurate, and conclusive experiments, furnished a definite explanation of all the phenomena. They are simply due to the cold produced in different bodies by radiation. As we have seen in our essays in previous Reports of the Patent Office, the earth is constantly radiating heat into celestial space, and is constantly receiving it from the sun during the continuance of that body above the horizon. As long as the heat from the sun exceeds that radiated into space, the temperature of the surface of the earth and that of the air in contact with it continues to increase; but when the two are equal, the temperature remains stationary for a short time, and then begins to decline as the heat of the sun, on account of the obliquity of the rays, becomes less than the radiation into space. The maximum of heat generally takes place between 2 and 3 o'clock in the afternoon, and the cooling from this point goes on until near sunrise of the next morning. As soon as the sun descends below the horizon, the cooling of the surface of the earth takes place more rapidly if the sky be clear, the air in contact with grass and other substances which are cooled by this radiation, will deposit its moisture in a manner analogous to that of the deposition of water on a surface of a metallic vessel containing a cold liquid. Although the atmosphere may contain the same amount of vapor, yet the quantity of dew deposited during different nights, in different places, and on different substances, is very different. It is evident that, all things being equal, it must depend upon the quantity of moisture, since if the air were dry no deposition could take place; and, indeed, it has been remarked that on some parts of the plains west of the Mississippi dew is never observed. It must also depend upon the clearness of the sky; for if the heavens be covered with a cloud the radiant heat from the earth will not pass off into celestial space, but will be partly absorbed by the cloud and radiated back to the earth. This is not a mere hypothesis, but has been proved by direct experiment. The author of this article, while at Princeton, some years ago, placed a thermo-electric apparatus in the bottom of a tube provided with a conical reflector, and thus formed, if the expression may be allowed, a thermal telescope, with which the heat of a cloud of the apparent size of the moon was readily perceptible. When this instrument was directed first to the clear sky in the vicinity of a cloud, and then immediately after to the cloud itself, the needle of the galvanometer attached to

the thermo-electric pile in the tube always deviated several degrees. At first sight it might appear, from this experiment, that the heat of the cloud was greater than that of the transparent air in which it was floating, but this was not necessarily the case; the rays of heat from the apparatus when it was directed into the clear sky passed off into celestial space, while, when the instrument was directed to the cloud, they were absorbed and radiated back. It is probable, however, that the lower surface of the cloud is really a little warmer than the air in which it is floating from the radiation of heat by the earth, while the upper surface is probably colder on account of the uncompensated radiation into space. But be this as it may, the counter radiation of the clouds prevents the cooling down of the bodies at the surface of the earth sufficient for the deposition of dew, or at least to allow of the formation of a copious quantity. A haziness of the atmosphere, and it is probable a large amount of invisible vapor, will retard the radiation, and hence a still, cloudless night, without a deposition of dew, is considered a sign of rain. The amount of deposition of dew will also depend upon the stillness of the atmosphere; for if a brisk wind be blowing at the time, the different strata of air will be mingled together, and that which rests upon the surface of the ground will be so quickly displaced as not to have time to cool down sufficiently to produce the deposition.

Again, the deposition will be more copious on bodies the surfaces of which are most cooled by the radiation. It is well known that different substances have different radiating powers. The following table from Becquerel exhibits the proportional tendency of different substances to promote the deposition of dew. The figures do not represent the relative emissive power, but the combined effects of emission and conduction:

1.	Lamp black	100
2.	Grasses	103
3.	Silicious sand	103
4.	Leaves of the elm and the poplar	101
5.	Poplar sawdust	99
6.	Varnish	97
7.	Glass	93
8.	Vegetable earth	92

Polished metals are, of all substances, the worst radiators; they reflect the rays of heat as they do those of light, and it would appear that by internal reflection the escape of heat is prevented from the capacity of the metal. In order that the surface of a body should cool down to the lowest degree, it is necessary that it should be a good radiator and a bad conductor, particularly if it be in a large mass and uninsulated. Thus a surface of a mass of metal coated with lamp black, though it radiates heat freely, will not be as much cooled under a clear sky as a surface of glass, since the heat lost at the surface is almost immediately supplied by conduction from within. If, however, a very small quantity of metal, such as gold leaf, be suspended by fine threads, the dew will be deposited, because the

heat which is radiated is not supplied by conduction from any other source, and hence the temperature will sink to a low degree.

M. Melloni has, within a few years past, repeated the experiment of Wells, established the correctness of his conclusions, and added some particulars of interest. He found that the apparent temperature of the grass, which in some cases was 8° or 10° lower than that of the air at the height of 3 or 4 feet, was not entirely due to the actual cooling of the air to that degree, but to the radiation and cooling of the thermometer itself, the glass bulb of which is a powerful radiator. To obviate this source of error in estimating the temperature he placed the bulbs of his thermometer in a small conical envelope of polished metal of about the size of an ordinary sewing thimble. This prevented a radiation, and, by contact with the air, indicated its true temperature. He found, with thermometers thus guarded, that the solid body was in no case cooled down more than 2° below the temperature of the surrounding air, and that the amount of radiation was nearly the same at all temperatures. The explanation, therefore, of the great cold of the air between the blades of grass is as follows: By the radiation of the heat, the grass is at first cooled two degrees lower than the air at the surface of the earth, and next the thin stratum of air which immediately surrounds the grass is cooled by contact to the same degree. It then sinks down and another portion of air comes in contact with the blade of grass, and is in its turn cooled to the same extent, and so on until all the air between the blades is two degrees lower than that of the air farther up. The radiation, however, continues, and a stratum of air from the mass already cooled is cooled two degrees more, which sinks down as before, and so on until the air between the blades is cooled to 4° below its normal condition; and in this way the process may be continued until the temperature descends to 8° or 10° below that of the stratum of air a few feet above. In this way we can readily explain the small amount of dew deposited on the tops of trees, since the air as soon as it is cooled sinks down toward the ground, and its place is continuously supplied by new portions of the atmosphere. To the same cause, we may attribute copious deposition of dew on wool and other fibrous materials which, though they do not radiate heat more freely into space, they entangle and retain the air between their fibres, and thus allow the cooling process we have described to go on. It would appear that spider-webs radiate heat freely into space, since they are generally covered with a large amount of dew; their insulated position prevents them from renewing their heat, but, according to the above principle, a much larger amount of deposition ought to be produced by the same material, were it loosely gathered up into a fibrous mass. The fact of the screening influence of the clouds teaches us that a thin cloth or even a slight gauze supported horizontally over tender plants is sufficient to neutralize the radiation, and to prevent injury from frost during the clear nights of spring or autumn. The same effect is produced by artificial clouds of smoke.

Since radiation from the surface of the earth is most intense on

clear nights, when the moon is visible, many of the effects which are due to this cause, have been referred to lunar influence; for example, a piece of fresh meat exposed to the moonlight is said to become tainted in a few hours; this may arise from the deposition of moisture on the surface of the meat due to the cooling from radiation. The moon itself, however, acts as a cloud and radiates back to the earth a portion of the heat which it received from the earth, as well as a portion of that which it received from the sun; and hence Sir John Herschel has referred to this cause, with apparent probability, the origin of an assertion of the sailors, that "the moon eats up the clouds." He supposes that they may be dissipated by the radiant heat from that body, which, being of low intensity and but feebly penetrating the lower stratum of the atmosphere, may serve to dissipate the clouds. Though a wrong explanation is generally given by the popular observer of natural phenomena, and though effects and causes are frequently made to change places in his explanations, yet it is true, as Biot has properly said, that the scientist who devotes himself assiduously to investigate the subject of popular errors, will find in them a sufficient amount of truth to fully repay him for his labor.

Formation of fogs.—The difference between a fog and a cloud relates principally to the conditions under which they are severally formed. A fog has been aptly called a cloud resting on the earth, and a cloud a fog suspended in the atmosphere. The circumstances under which a fog is usually produced are the following: Either the surface of the earth or water is warmer than the air, or it is cooler. If the temperature of a river or of a damp portion of ground is higher than that of the atmosphere which rests upon it, the warmer surface will give off vapor of an elastic force due to its temperature. Should the superincumbent air be extremely dry, the vapor will diffuse itself up through it in an invisible form, without condensation, and no fog will be formed until, by the continuation of the process, the air becomes completely saturated; and then if an excess of heat remain in the evaporating surface, the fog will be produced, and will increase in density and height so long as a difference of temperature continues. If, however, a wind be blowing at the time, so that successive portions of unsaturated air are brought over the place, no fog will be produced. A still atmosphere, therefore, is a necessary condition to the accumulation of fog.

The foregoing is the usual method in which fog is produced, for it is well known that in cold weather the surfaces of lakes and rivers are much warmer than the strata of air which rest upon them.

It is, however, frequently observed that fogs are formed during still nights, in low places, when the surface of the ground is colder than the stratum of the atmosphere which rests upon it, and, indeed, we have shown that the temperature of the surface of the earth on a still and clear night is always lower than that of the air which is immediately in contact with it; and it is not easy, without further explanation, to see the reason why fogs should not always be produced in this case as well as dew. When the atmosphere is still, the condensation of the vapor by the coldness of the surface is so gradual that the air is not

disturbed, and the strata immediately above the grass has relatively less moisture in it than that a few yards higher; hence, no fog ought to be produced in this case, since all the precipitation produced is that which has settled directly upon the grass in the form of dew. In this case we may define the dew to be a fog entirely condensed into drops of water. The question still arises how, under these conditions, can a fog really be produced. The answer is, that another condition is required, namely, that the surface, cooled by radiation, should slope to a lower level, as in the side of a hill or the concave surface of the sides of a hollow. In this case the superincumbent stratum of air of which the temperature has been lowered by contact with the cold earth, flows down the declivity, by its greater weight, into the valley below, and there, mingling with the damp air which generally exists in such places, precipitates a part of its transparent vapor into visible fog. In the way we have described, large hollows are sometimes seen in the morning, filled with a mass of fog, exhibiting a definite and level surface, presenting the appearance of a lake of which the shores are bounded by the surrounding eminences; and if a depression of sufficient depth occurs in any part of the circumference of the basin, through this the fog is seen to flow like a river from the outlet of a lake.

The explanation we have here given of the formation of fog in low places is also applicable to the phenomenon, frequently observed, of early frost in the same localities. As rapidly as the air is cooled on the sides of sloping ground it sinks into the valley below, and its place is supplied by the warmer air above, which has not been subjected to the cooling influence. In the vicinity of Washington, the hollows are sometimes found several degrees colder than the more elevated parts of the surrounding surface. Fogs are produced on the ocean when a gentle wind, charged with moisture, mingles with another of a lower temperature. The wind from the Gulf Stream mixing with the cold air which rests upon the water from the arctic regions, which, as we have before stated, flows along close to the eastern shores of our Continent, gives rise to the prevalence of fog over the Banks of Newfoundland.

There is another atmospherical phenomenon which, though it does not affect the hygrometer, and is only indirectly connected with moisture, is generally classed with fogs. I allude to what is called dry fog—a smoky haziness of the atmosphere, which frequently extends over a large portion of the earth. The nature of these fogs is now pretty well understood, and more refined observations, particularly with the microscope, have served to dissipate the mystery in which they were formerly enshrouded. When a portion of the air in which the fog exists is filtered, as it were, through water, and the substance which is retained is examined by the microscope, it is found to consist of minute fragments, in some cases, of burnt plants, and in others of the ashes of volcanoes. It is surprising to what a distance the pollen of plants and minute fragments of charred leaves may be carried. Samples of substances which have been collected from rain water and examined microscopically by Professor Schaeffer, of Washington,

at the request of the Smithsonian Institution, have been found to consist of portions of plants which must have come from a great distance, since the species to which they belong are not found in abundance in the localities at which the specimens were obtained. It is highly probable that a portion of the smoke or fog-cloud produced by the burning of one of our Western prairies is carried entirely across the eastern portion of the Continent to the ocean. On this subject, Dr. Smallwood communicated a series of interesting observations to the American Association at their meeting in Albany, in 1855. Particles of matter of the kind we have described are good absorbers and radiators of heat, and hence in the daytime they must become warmer than the surrounding atmosphere, and tend to be buoyed up by the expansion of the air which exists in the interstices between them, while at night they become cooler by radiation than the surrounding air, and tend to condense upon themselves the neighboring moisture, and consequently to sink to a lower level. It is on this account that the smoky clouds which are produced by the enterprising manufacturing establishments of Pittsburg and other Western cities, in still weather, sometimes descend to the surface of the earth, and envelop the inhabitants in a sable curtain more indicative of material prosperity than of domestic comfort. From the density and the wide diffusion of these smoky clouds they must produce a sensible effect upon the temperature of the season of the year in which they occur. During a still night, when a cloud of this kind is over head, no dew is produced; the heat which is radiated from the earth is reflected or absorbed and radiated back again by the particles of soot, and the cooling of the earth necessary to produce the deposition of water in the form of dew and hoar frost is prevented.

So well aware of this fact are the inhabitants of some parts of Switzerland that, according to a paper by Boussingault, in a late number of the "Annales de Chimie," they kindle large fires in the vicinity of their vine fields and cover them with brush to produce a smoke-cloud by which to defend the tender plants from the effects of an untimely frost. Though the first announcement of the proposition by some of our earlier meteorologists, that the peculiar condition of the atmosphere known as Indian summer might be produced by the burning of the prairies, was not thought worthy of any comment, yet the advance of science in revealing the facts I have stated renders this hypothesis by no means unworthy of attention.

A large amount of smoke existing in the atmosphere must have a very sensible effect in ameliorating the temperature of the season by preventing the cooling due to radiation; and although this may not be the sole cause of the peculiarity of the weather we have mentioned, it may be an important consideration in accounting for the smoky appearance of the air, and the effect produced upon the eyes.

In concluding this section, we would commend to the attention of the microscopists of this country, as a readily accessible and interesting field of research, the subject of atmospheric dust. The atmosphere constantly holds in suspension a mass of particles derived from the mineral crust of the globe and from animals and vegetables, which,

by being deposited in undisturbed positions, serves as a record to be read by the microscope of changes alike interesting to the antiquarian and the naturalist. On this subject, M. Pouchet has lately presented a paper to the French Academy of Science, in which he enumerates the particles of mineral, animal and vegetable origin, which he has found deposited from the atmosphere. Under the latter he mentions specially particles of wheat flour which have been found as an ingredient of dust in tombs and vaults of churches undisturbed for centuries. The dust floating in the atmosphere may readily be collected by filtering the air through a tube swelled in the middle, bent into the form of a syphon, partially filled with water and attached at the lower end to the vent-hole of a cask from which water is drawn, or simply by sucking through the air by means of the mouth.

Rain.—The discussion of the *rationale* of the production of rain will be given in a subsequent part of this article. We shall in this place, however, state some facts in regard to it which are naturally connected with the general subject of the existence of vapor in the atmosphere.

The humidity so constantly supplied to the air by evaporation is returned to the surface of the earth principally in the form of rain, which is the result of the union of the very minute particles of water which constitute the mass of clouds. Without stopping to inquire into the cause of union in this place, we may remark that we think it probable that it always results from the further condensation of the invisible vapor which exists in the atmosphere, and which first assumed the condition of a cloud. Rain, it is true, has been observed apparently to fall from a cloudless sky, but the occurrence is one of extreme rarity, and it seems hardly possible to be certain that it is not brought by wind, at a high level, from a distance.

A knowledge of the quantity of rain which falls in different portions of a country is important, not only in regard to agriculture, but also with reference to internal navigation, to the application of hydraulic power, the occurrence of devastating floods, the supply of cities with water, and also to the sanitary condition of districts.

Almost every portion of the earth on which rain falls is provided with natural drains, which carry off the surplus water, above that which evaporates, to the ocean whence it came; and, taking the earth as a whole, the same amount of water must be returned to the ocean as was taken from it by evaporation.

Nearly the whole surface of the earth is divided into basins, each provided with a separate system of drainage. The boundaries of these basins can readily be traced on the map by drawing a line around between the heads of the streams, the waters of which find the level of the ocean through the channels of different rivers. Thus we have the great primary basins of the Amazon, the Mississippi, and the St. Lawrence, and the secondary basins of the Ohio, the Missouri, and the Tennessee, giving the latter name to those which pour their waters, not into the ocean, but into another river.

A knowledge of the amount of rain which falls on each of the subordinate basins supplying a river like the Mississippi with the

water which passes through it into the ocean, if transmitted by means of the telegraph, would be of the greatest value, in connection with previous experience as to the elevation of the water of the river corresponding to a given indication of the rain-gauge, in furnishing the means by which the effects of floods may be guarded against, and the labors of the husbandman along the banks preserved, in many cases, from destruction. A single gauge in each subordinate basin would be sufficient to furnish valuable practicable information of this kind, and, in the case of the Mississippi River, if confined to the basins on the eastern side, would suffice to give indications of a sudden rise at the mouth of the river, since the water which is furnished from the western part of the valley of the Mississippi is more constant in its amount, or, in other words, not so subject to fitful variations.

The simplest method of measuring the rain, which any one may practice for himself, is to catch the water in a cylindrical vessel, like an ordinary tin pail, and to measure the depth in inches and tenths of an inch after each shower. It is hardly necessary to remark that the vessel should be so placed that it may not be screened by trees, buildings, and other obstacles from the wind which bears along the falling drops. The object of the investigation is to ascertain the number of inches of water which fall from the clouds on a given space. in a given time—for example, a year or a season. It is well known that, while the wind is blowing strongly, the drops descend in an oblique direction, and gauges have been proposed which, by the action of the wind, would so incline their mouths as always to present them at right angles to the direction of the drops; but gauges of this kind would not give the indication required, which is that of the absolute quantity of rain which falls on a given horizontal extent of the surface of the earth.

A remarkable fact has been observed as to the amount of rain collected at different heights. It is a well known phenomenon, of which we shall give the explanation hereafter, that on the windward side of a mountain a greater amount of rain falls annually than at a less height on an extended plain. The effect, however, to which we now refer, is just the reverse; since it is found that less rain falls on the top of a tower, and even of an ordinary building, than at the bottom. This phenomenon is due, in part at least, to the fact that a drop in its descent through a foggy atmosphere, in which the rain is falling, catches in its path all the minute particles of water between the upper and lower stations. It cannot be due, except in a slight degree, to the condensation of the transparent vapor in the atmosphere, which occupies the line of its descent, since the condensation of this would rapidly heat the drop of water, although it was considerably lower than the air, on account of falling from a colder region. The principle cause of the difference is to be found in the effect of the wind in passing over and around the edifice on which the gauge is placed. The effect of this cause was first investigated by Professor Bache, of the United States Coast Survey, who made a series of observations with a number of gauges placed on different

sides of the roof of a shot tower in Philadelphia. He found that different quantities of rain were collected by gauges thus placed.

To explain the effect of the wind, we may refer to what takes place when an obstacle like that of a large stone is found with its upper end just below the surface of a running stream. The water of the current will pass over and around the stone, and will rise above the general surface; there will exist a tendency to a partial vacuum on the sheltered side; the liquid in passing over and around the stone will be accelerated; the particles of water which pass around the stone, supposing it to be a cylinder, will traverse a space equal to the circumference of the circle, while those moving along the general current, and not deflected, will pass through a space equal to the diameter of the same circle. A similar effect would be produced by the wind striking against a tower. The portion which passes around the top will be accelerated; that which strikes against the top will be deflected upward, and in both cases a diminution in the quantity of rain which falls on the top of the tower will be the result. Suppose the wind is coming from the west, and striking with force against the side of the tower which faces that direction, it will be deflected upward, and thus retard the fall of rain on the near side of the roof of the tower, and precipitate it over the leward side, while the portion of wind which passes around the circumference of the tower, near its top, will be accelerated, and will by the latter action impart its motion to the air on the north and south sides of the roof of the tower, which will cause the drops of rain to be crowded together on the leeward side.

The effect of the upward deflection of the wind and the acceleration of the rain, under conditions such as we have just described, are strikingly illustrated by the observations which were made on the high tower of the Smithsonian Institution. Three gauges were placed on the roof of this tower—one on the west, one in the centre, and a third on the east side. Now, if the prevailing wind is west, we should expect, if the theory which we have presented is correct, that the west gauge would contain the smallest quantity of water, the middle one next, and the one on the east side the greatest; and this was found to be actually the case.

The action of the wind also materially affects the amount of water which falls in different gauges of different forms and sizes at the surface of the earth. It is well known that different gauges, which indicate the same amount of rain in calm weather, differ materially in the quantity of water which they collect in high winds. If the gauge be of considerable size, and project above the surface of the earth, the air will be deflected upward and accelerated around it, as in the case of the tower; nor is this result obviated by sinking the large gauge to the level of the earth, since in that case the current curves down into the gauge and tends to carry out a portion of the falling drops on the opposite side. From a series of experiments made at the Smithsonian Institution, and continued for several years, it is found that a small cylindrical gauge, of 2 inches in diameter, and about 6 inches in length, connected with a tube of half the

diameter, to retain and measure the water, gives the most accurate results. In still weather it indicates the same amount of water as the larger gauges, but when the wind is high it receives more rain for, on account of its small size, the force of the eddy which is produced is much less in proportion to the momentum of the drops of water. This gauge, which has been copied from one introduced by Mr. James Stratton, of Aberdeen, may be still further improved by cutting a hole of the size of the cylinder into a circular plate of tin of 4 or 5 inches in diameter, and soldering this to the cylinder like the rim of an inverted hat, 3 or 4 inches below the orifice of the gauge.

The effect of the wind in disturbing the level of light snow in the vicinity of buildings illustrates the general principles which we have been endeavoring to explain. When a rapid current of air is obstructed by a building, the acceleration of its velocity on the side of the eddy is marked by the removal of the snow to a considerable distance. Indeed, all the phenomena we have mentioned in regard to rain are illustrated by the extraneous motion given to the particles of descending snow.

CONSTITUTION AND PHENOMENA OF THE COMPOUND ATMOSPHERE.

General exposition.—From the principles we have endeavored to explain, we may now readily infer what would be the general effects if the earth were surrounded with an ocean of water and devoid of an atmosphere. At first sight it might appear that all the water of the ocean would immediately pass into vapor; but, on a little reflection, it will be seen that this would not be the case. A definite amount of vapor would be formed, which, by its pressure on the surface of the water, would prevent any further evaporation, provided the whole globe and the space around it were of a uniform and constant temperature.

A portion of vapor would rise from the water, and would expand as it arose until the upper atoms were so far separated that their repulsion would become insensible, and they would be retained as an appendage to the earth merely by their weight. The upper layer of vapor would press on the next lower, and this on the next, and so on with accumulating weight as we descend; the aqueous atmosphere surrounding the whole earth would thus be found increasing in density as we approached toward the liquid surface. If the temperature of the earth and of the space around it were 60° it will be seen by table *A* that the pressure of this aqueous atmosphere at the surface of the earth would be equal to half an inch of mercury; if the temperature were 100°, it would be equal to 2½ inches. This pressure, however, would be sufficient to prevent any further evaporation, unless, as we have said, an increase of temperature took place.

In order that such an atmosphere should be in equilibrio, it would be necessary that the absolute amount of heat in equal weights and at different heights should be the same; or, in other words, it should follow the same law as that of a gaseous atmosphere. There would, however, be this great difference between the two atmospheres: The

one would be readily condensed by a diminution of temperature beyond a certain point into water; while the other would remain a permanently elastic fluid at all temperatures. If, therefore, the space beyond the atmosphere were colder than that which would be due to the diminution which would naturally take place in an aqueous atmosphere, a continual rain would be the result, the vapor would be constantly evaporated from the surface of the earth, and constantly condensed by the cold above. Now, were it not for the gaseous atmosphere which surrounds the earth and offers a resistance to the ascent of the aqueous particles, we think such a condition would actually exist. We are inclined to this belief from the facts which have been stated indicating an exceedingly low temperature to the space beyond our atmosphere.

Be this, however, as it may, an atmosphere of this kind would be exceedingly unstable, and if any portion of the earth's surface was colder than another, there would be a constant condensation at the coldest parts, and a constant evaporation at the warmer to restore the equilibrium. If, for example, the heat of the equatorial regions were 80°, and that of the polar regions at zero, the elastic force of the vapor at the former place would be 2⅓ inches, while at the latter it would be but 0.006 of an inch; hence an equilibrium could not exist, and there would be a continued series of currents from the equator to the poles, a perpetual condensation of vapor into water at the latter, and a constant evaporation of liquid into vapor at the former, for the supply of which a series of ocean currents would be established. A tendency to the same effect must exist in the compound atmosphere of air and vapor which actually surrounds our earth, but the resistance to the permeation of the vapor is so great that a considerable inequality of the elastic force of vapor continually exists in different parts of the earth.

Though there is a constant tendency to a diffusion of vapor from the equator to the poles, yet the greatest disturbance of the equilibrium of our atmosphere results from the diminution of temperature as we ascend in the atmosphere, and for the establishment of the principle on which this disturbance depends, and the consequences which flow from it, we are indebted to the laborious, persevering, and sagacious investigations of Mr. James P. Espy.

It is well known from observation that the air diminishes in temperature as we ascend, at the rate of about one degree Fahrenheit for each 100 yards or 300 feet. If, therefore, a portion of air be transferred from the surface of the earth to a height in the atmosphere, it will be cooled to the temperature of the stratum of air at which it arrives; but it is proper to observe at the beginning of the explanation that this cooling will not be principally due to the coldness of the space to which the mass of air has been elevated, but chiefly to its own expansion. If the air, for example, expands into double the space by being subjected to half the pressure, it is evident that the amount of heat which it contains will be diffused through twice the amount of space; and hence, though the absolute quantity of heat remains the same, its intensity of action, or in other words,

its temperature, will diminish and the substance will become much colder. This is a principle to which we have before alluded, and which will be frequently applied hereafter in the explanation of phenomena.

If, in accordance with the foregoing, an upward motion takes place from any cause whatever in a mass of air saturated with vapor, a precipitation must instantly follow. For example, if we suppose the moist air to be raised to the height of 1,000 yards, and if we further suppose the temperature at the surface to be 70°, the temperature at the height of 1,000 yards will be 60°; and if we enter table *B*, page 438, with these numbers, we shall find opposite 70°, 7.992 grains of vapor for each cubic foot, and opposite 60°, 5.756 grains of vapor for each cubic foot. In this case, therefore, nearly 2.236 grains of vapor will be converted into water and fall as rain. We see from this simple consideration that the mere upward motion of a portion of saturated air, from whatever cause produced, must give rise to a precipitation of vapor in the form of water. It may not be in sufficient quantity to come to the earth in the form of rain, but may remain in the air in the intermediate state of a fog or a cloud.

If the air be not saturated entirely with vapor, no precipitation will ensue until it rise to the height at which it becomes by the diminution of temperature fully saturated. Suppose, for example, the air at the surface is 70°, and the vapor in it is that due to 65°; then it is plain that it must be reduced in temperature 5° before precipitation commences, and this reduction will take place at the height of 500 yards, since, as we have just stated, the reduction of temperature is one degree for each 100 yards of ascent. And by this simple method Mr. Espy has shown that we may, on a given day, approximately estimate the height of the base of a cloud by merely knowing the dew-point at the surface of the earth; for if we find that while the temperature of the air is 70°, and at the same time there is required to produce a deposition of dew on the exterior surface of a tumbler, a reduction of temperature of 6°, for example, of the water within, the cloud would be 600 yards above the surface of the earth, because it will be necessary the vapor should rise to that height in order that the whole mass may be cool to the point of deposition. The bottom of this cloud will be horizontal, because the precipitation begins at a definite temperature due to a definite height; its form will be that of a mushroom, bulging out and gradually increasing in altitude; in short, will be precisely that form of cloud which is denominated cumulus, and which may be seen during a moist warm day forming in a still atmosphere gradually extending upward until the precipitation of vapor begins to be so copious that the particles of water coalesce and form drops of rain, which, falling down directly through the base of the cloud, leave but a remnant of very attenuated vapor, which is blown away and forms, according to Mr. Espy, the cirrus or hair clouds.

We can also readily infer from the same principle that, so long as a current of air moves horizontally over a plain of uniform temperature, no precipitation will take place; but if in its course it meets

with a mountain, up the acclivity of which it will be obliged to ascend, and thus come under a less pressure and lower temperature, a precipitation must ensue. We have in this way a natural explanation of the effect of a mountain in causing a cloud and a fall of rain, and need not refer the phenomena to the unscientific explanation of attraction so frequently given; we say unscientific, because the attraction of gravitation at a distance, on an atom of vapor, is almost infinitely small, and could have no appreciable effect in drawing the clouds. If we suppose, in addition to the preceding case, that the air, after ascending to the top of the mountain and forming a cloud by the precipitation of its moisture, descends on the other side to the same level, it will arrive at the earth much dryer than it went up. If the height of the mountain is not sufficient to reduce the temperature enough to produce a rain, but merely a cloud, and if we suppose the current of air to continue its course, and to descend to the same level on the other side, it will, as it descends, become condensed as it comes under greater pressure; the temperature will increase for a like reason to that which caused its diminution in the ascent.

We have in this way an explanation of the paradoxical appearance of a strong wind blowing across the top of a mountain, while a light cloud, which crowns its summit and perhaps hangs over its sides, remains apparently immovable. The truth is that this cloud, which appears stationary, is in reality a succession of clouds constantly forming and constantly dissolving. Every portion of air which ascends the mountain, by its expansion and cooling tends to form a new portion of cloud, and, in its descent, by its condensation and increase of temperature tends to dissolve a similar portion. The cloud is consequently forming on one side and dissolving on the other, and in this condition may aptly represent the dynamical equilibrium of the human body, which, by every expiration of breath is wasting away, and by every pulse of the heart is renewed.

What we have given may be considered as the more obvious inferences from the first and simplest proposition of Mr. Espy's theory. The phenomena, as they occur in Nature, however, are more complex, and another effect is produced by the upward motion of the air, which very essentially modifies the results; we allude to the great amount of heat which is evolved during the condensation of vapor into water. We have stated that the heat evolved from the combustion of 20 pounds of dry pine wood is absorbed by a cubic foot of water at the ordinary temperature of the air in its conversion into vapor, and it is evident that this vapor cannot be reconverted into water without giving out to the surrounding bodies an amount of heat equal to the combustion of 20 pounds of dry wood.

In order to give an idea of the importance of this principle, which is an essential element in the theory of Mr. Espy, it will be necessary to dwell somewhat longer on other points before considering more minutely the results to which it leads.

Statical equilibrium of the compound atmosphere.—Before proceeding to discuss the subject further, it will be necessary to consider the question, which appears to be in a very unsettled state, as to

the effect of vapor in the atmosphere while in the act of diffusion. On the one hand, the resistance which air offers to the diffusion of vapor has been too much disregarded, and, on the other, we think too much effect has been attributed to this cause. It is customary in reducing the observations made at European observatories to deduct the elastice force of the vapor in the atmosphere at a given time from the height of the barometer, and to consider the remainder as the pressure of the dry air. This process would give a correct estimate of the pressure of the dry air, provided the gaseous envelope of the earth were a perfect vacuum to the vapor, and the latter was, consequently, regularly diffused through the space in accordance with its diminution of density due to a diminution of pressure and temperature as we ascend; but this we know to be far from the fact. In the balloon ascent of Mr. Welsh, on the 21st of October, 1852, the tension of vapor at the elevation of 800 feet was observed to be greater than at the ground, and at a height of 3,000 feet it was still greater. In an ascent of the same observer on the 17th of the previous August, the tension continued to increase until an elevation was reached of 8,400 feet.

To render this point more clear, we will for a moment consider the relation of tension and pressure. By the tension of vapor, as we have seen, we understand the elastic force or repulsion of the atoms combined with the action of heat by which they tend to enlarge the space in which they are inclosed, and to force down the mercurial column in the experiments by which table *A* was constructed. At the temperature of 60° F. this elastic force is just balanced by a column of half an inch of mercury. Let us now consider the nature of tension in regard to the atmosphere. For this purpose, let us suppose a piece of paper pasted over the mouth of a glass tumbler so as to be air tight. This paper, though of a very fragile texture, is not broken in by the superincumbent pressure of a column of air extending to the top of the atmosphere and pressing with a force equal to nearly 15 pounds on every square inch of the surface of the paper, because it is counteracted on the lower surface by an upward pressure due to the repulsive action or elastic force, or, in other words, tension of the inclosed air. The weight of the superincumbent column on the upper side of the paper is known as the weight or pressure of the atmosphere, while the upward pressure on the lower side, due to the repulsion of the atoms, is designated indiscriminately by the terms *elasticity*, *elastic pressure*, *elastic force*, and simply the *tension* of the air.

The force, analogous to the latter, in the case of vapor is more generally known by the name of *tension*, though it is sometimes called *elastic pressure*. In the foregoing experiment, if the pressure of the superincumbent air is increased, the exterior surface of the paper will assume a concave form, the atoms of the inclosed air will be pressed nearer together, and their repulsive energy will be increased by the approximation of the atoms, and thus a new equilibrium will take place. If, conversely, the column of air above the tumbler be diminished in weight, and the surface of the paper will assume a con-

vex form, because the atoms within the tumbler being pressed with less force will separate to a greater distance, and the repulsion will be diminished by their separation, until a new equilibrium will be produced between the pressure without and the repulsion within. In this case, variations of the elastic force or tension of the air within the tumbler become an exact measure of the pressure of the exterior column, provided the temperature remains the same; and it is upon this principle that the barometer called aneroid is constructed. It consists, as it were, of a flat flask of thin metal, filled with air and hermetically sealed by means of solder; the motion of the sides of this flask, precisely analogous to that of the paper closing the mouth of the tumbler, is communicated by means of lever and wheel work to a hand, which indicates the variations of the tension of the inclosed air and, consequently, of the weight of the atmosphere.

Now, if the aqueous vapor formed a separate or entirely independent atmosphere around the earth, the variations in its pressure would be accurately measured by the variation of its tension or elastic pressure at the surface; but since the vapor, on account of the resistance of the air with which it is entangled, is not uniformly distributed, its tension at the surface cannot give a true measure of its whole pressure. It is true that, as a whole, the weight of the atmosphere is increased by the addition of every grain of water which arises in the form of vapor from the surface of the earth or ocean, but when the evaporation is copious in a limited space, as for example, over the surface of a pond of water, or a portion of the earth subject to sunshine while the regions around are obscured by clouds, the elastic force of the vapor tends to diminish the specific gravity of the aerial column, and to produce a fall rather than a rise of the barometer. This is always the case while the vapor is in the act of diffusion; for the resistance of the atmosphere at the surface of the expanded volume of vapor may be considered as an elastic envelope, against which, as in the case of the India-rubber bag to which we have previously alluded, the aqueous atoms press, by their repulsion, and tend to expand it, and therefore to increase their own volume, as well as that of the inclosed atmosphere.

If the vapor ascended into the air without resistance, as in a vacuum, it would, in all cases, increase the weight of the latter; but, on account of the resistance under the conditions we have just mentioned, the ascending vapor, by its elasticity, would lift up the atmosphere, tend to lessen its pressure, and therefore temporarily to expand the air within the space included within the surface of the aqueous volume. It is, therefore, a difficult point to ascertain, in the explanation of these phenomena, when we must consider the weight of the atmosphere increased or when diminished by the pressure of vapor.

It is evident from the experiments which have been made on evaporation under diminution of pressure of air, that the resistance we have spoken of to diffusion diminishes in proportion to the rarity of the atmosphere; and hence the vapor which exists at great elevations would be in a state of entire diffusion, and its presence would

increase instead of diminishing the specific gravity of a portion of air through which it was disseminated.

We think erroneous conclusions have frequently been arrived at on account of a want of proper consideration of this subject, and from too exclusive an attention to the expansive influence of the aqueous vapor in a confined space on the one hand, and the increased pressure of the whole atmosphere by the addition of vapor on the other.

It is probable, however, that in portions of the earth in which the air is constantly saturated at a uniform temperature, and at which the diffusion is permanently uniform, that if the elastic force of the vapor is subtracted from the whole height of the mercurial column, it will give the pressure of an atmosphere of dry air.

On the supposition that the vapor is uniformly distributed through the atmosphere, which will not be far from the truth if considered with reference to the principal zones of the earth, we can calculate the whole weight of water contained. If the water were at the boiling point its elastic tension or pressure would be equal to the pressure of the atmosphere, and in this case it would support 30 inches of mercury, or its equivalent, 407.4 inches of water; and since transparent vapor observes the same law of expansion and contraction by variations of pressure and temperature that dry air does, it is clear that we shall have the following relation for any other temperature, namely, as 30 inches is to the quantity of mercury expressing the elasticity of the air at any temperature, so is 407.4 inches of water to the whole weight of the aqueous vapor, provided the weight of vapor is the same as that of the air. It has, however, been proved by the experiments we have described that vapor is only five-eighths of the density of air, and, therefore, the quantity found by the foregoing relation must be reduced in this ratio.

If we assume that the dew-point is on an average 6° below the temperature of the air, and allowing the temperature of the tropical regions to be 82°, we shall have the following proportion: 30 : 0.897 : : 407.4 : 12.181. This last number must, however, be multiplied by $\frac{5}{8}$, and this will give us 7.61 inches. From this it will appear that if the atmospheric columns at the equator were to discharge their whole watery store, the moisture precipitated would cover the earth to the small depth of 7.61 inches; and from a similar calculation we find that if the columns of air resting upon the city of Washington were to precipitate at once all their moisture, the quantity of water would be indicated by about 3 inches of the gauge. To supply, therefore, 30 or 40 inches of rain in the course of a year, it is necessary that the vapor contained in the atmosphere should be very frequently renewed, and that consequently localities which cannot be reached by moist winds must be abnormally dry.

Effects of vapor on the general currents of the atmosphere.—From what we have previously stated it is evident that the atmosphere which surrounds the globe, and which is composed of two portions, one of permanent elastic gases, and the other of a readily condensable vapor containing a large amount of latent heat, must frequently

be in a state of tottering equilibrium, liable to be overturned by the slightest extraneous forces, and, in assuming a more permanent condition, to give rise to violent commotions and currents of destructive energy.

We have previously shown that the equilibrium of a dry atmosphere depends upon the fact that each pound from the top to the bottom of an aerial column contains approximately the same amount of heat. If, therefore, a portion of air be caused to ascend, by mechanical or other means, to a greater elevation, it will expand, and its heat being distributed through a larger space, its temperature will fall to that of the new region to which it has been elevated, and will again be in equilibrium. If, on the other hand, a portion of air be caused to descend, it will be condensed into a smaller space on account of the increased pressure, and its temperature will be raised to that of the stratum at which it has arrived. But this is not the case with moist air; for if by any means it be elevated above a given level, the coldness produced by its expansion will, as we have said, condense a portion of the vapor into water, and in this process the vapor will give out its latent heat to the surrounding air, and therefore the column in which this condensation has taken place will not be as cold as the surrounding atmosphere; consequently an upward force will still exist, the column will rise to a greater height, and a new portion of vapor will be formed, and so on until all, or nearly all, the vapor will be converted into water. In this way the steam power, which has been accumulated from the heat of the sun, is expended in producing commotions of the atmosphere connected with all the fitful and many of the regular meteorological phenomena of the globe.

It may be objected to this part of the theory of Mr. Espy that the condensation of the vapor in the atmosphere would tend to collapse it into a smaller space, consequently to render it heavier, and thus neutralize the effect of the expansion due to the evolution of the latent heat. The effect, however, from this cause is very small in comparison to that due to the expansion of heat; and this will be plain when we consider that the particles of vapor exist in the interstices between the particles of air, and in a close vessel tend to increase the volume only in proportion to their repulsive force, which, compared with that of the air, is small. For example, if a quantity of dry air were inclosed in an India-rubber bag, at a temperature of 60°, at the level of the sea, its elastic pressure outward on the sides of the bag would be equal to the weight of 30 inches of mercury, while the elastic force of vapor would only be equal to half an inch of mercury; so that we should have the enlargement of the bag expressed by the last term of the following proportion: If 30 inches of mercury give one foot what will 30.5 give? In this case, which is an extreme one, we see it would give but a little more than 1 per cent., and hence the diminution due to extracting the vapor from a quantity of air is very small, and far less than the expansion due to the evolution of heat. This will be evident from the following calculation of the effect produced by the condensation of a pound of vapor into water:

It is known from direct experiment that the condensation of one pound of vapor will raise 970 pounds of water 1°, or, if it were possible to heat water thus high, it would raise one pound of water 970°; but the capacity of air for heat is only one-fourth of that of water; therefore the condensation of one pound of steam would raise one pound of air 3,880°, or 10 pounds of air 388°. The above calculation is from Daniel's Chemical Philosophy, and is given as an illustration of the immense motive power due to the fall of a single foot of water in the form of rain. During a single rain, in 1857, water fell to the depth of 6 inches in the space of 36 hours, and considering merely the amount of ascensional power evolved by the condensation of the quantity of the liquid which fell on the roof of the Smithsonian Building, it would be equivalent to a thousand horse-power exerted during one day.

From these considerations it is evident that the general currents of the atmosphere must be very much modified by the action of the vapor, and very different from those we have described as belonging to dry air in our previous essays in the Reports of the Patent Office. Indeed, to such an extent are some of the general phenomena influenced by this cause that the motive power of the atmosphere has been referred to other causes than the action of the heat of the sun; but in this case, as in most other exceptions to a principle deduced from a wide generalization, like that of the action of solar heat on our atmosphere, the facts when rightly understood and properly interpreted serve but to establish more firmly the truth.

We shall now consider more minutely the effect of the formation and condensation of vapor in modifying the general circulation of the atmosphere. We have shown in our previous articles that if the earth were at rest in space, without revolution on its axis, heated at the equator and gradually cooled to a minimum point as we approach the poles, there would be a constant circulation of air from the poles, north and south, toward the equator. The air would rise in a belt encircling the whole earth. and would flow backward towards the poles above. In this simple circulation, at every place on the surface of the earth, in the northern hemisphere, for example, there would be a perpetual wind from the north flowing toward the equator, and above the same place, at the surface of the aerial ocean, there would be constantly a return current flowing from the equator toward the pole. It is evident, however, since the meridians converge together and meet at the pole, that the space between any two becomes less and less as we depart from the equator; hence, all the air which ascends at the equator could not flow entirely to the pole, but the larger portion of it would descend to the earth to return again to the equator, along the surface at some intermediate point, which would be, on an average, about the latitude of 30°, since the space included between this and the equator would be nearly equal to the remaining surface in each hemisphere. Again, as we have seen, the simplicity of this system of winds would be interfered with by the rotation of the earth on its axis. On account of this rotation, as a general rule, when a current moves from the equator, for example, in the northern hemi-

sphere, it would gradually curve to the east, and when it moves southward in the same hemisphere, it would curve to the west; the rapidity of curving in either case would increase as we approach the pole. On account of this curvature and deflection east and west of the upper and lower currents, together with the disturbance produced by the evolution of the latent heat, the simple system we first described will tend to separate, as we shall more fully see hereafter, into three distinct systems, which we have represented by *A*, *B*, and *C*, in the annexed figure, and by the several zones of arrows in diagram *A*, Pl. VIII.

Fig 5.

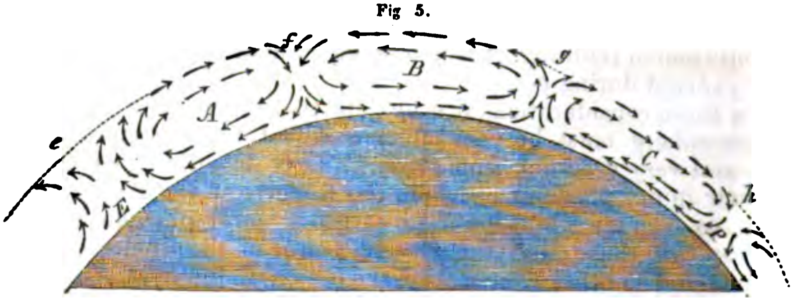


Fig. 5 is intended to represent an ideal section through a meridian of the northern hemisphere, and diagram *A* to illustrate the prevailing direction of the surface currents, particularly in the northern hemisphere. By comparing the two, it will be seen that the systems *A*, *B*, and *C* correspond with the three zones of arrows in diagram *A*. To supply the air which ascends in the region near the equator, the current on each side, on account of the rotation of the earth, as we have seen, takes an oblique direction, flows in the northern hemisphere from the northeast, and in the southern from the southeast; it continues its westerly motion, as it ascends, until it reaches its culminating point, and then flows backwards in an opposite direction, curving as it goes toward the east.

The surface currents on either side of the equatorial region, called the trade winds, as they pass over the ocean constantly imbibe moisture, and deposit but little in the form of rain, since there is no obstacle on the level surface of the water to produce an upward current, and the consequent diminution of temperature essential to the formation of rain. They, therefore, carry their moisture to the belt of confluence, where, in the ascent of the air, it is precipitated, evolves its latent heat, and develops its ascensional power. To render the ascent of these currents more plain we insert Fig. 6, which may be considered a transverse section across the equator at the belt of calms.

The air enters below on either side *D C*, rises upward in the middle space, and spreads out north and south above *D′ C′*. As the air ascends, it comes under less pressure, expands, becomes colder, and on this account condenses a portion of its vapor, which renders the air warmer and lighter than it would be if this evolution of caloric did not take place.

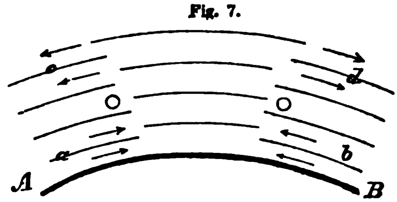
Hence the ascension continues, and the elevation to which the column attains is therefore much greater than it would be if the air were void of moisture. The condensation of the vapor takes place in the form of an immense amount of rain, which falls, by its superior weight,

Fig. 6

through the ascending air, *A*, *B*, and deluges the surface immediately below, in some places to such an extent that fresh water on the surface of the ocean has been found floating on the top of the salt water. Indeed, more rain falls on the surface within this belt than on the whole earth beside. On either side of the rain belt a cloud will be formed by the spreading out of the ascending air mixed with vapor, as shown in the figure. The falling rain, coming from a high elevation, and consequently from a low temperature, will cool the surface of the earth below that of the spaces on either side.

The pressure of the air in the ascending column will be less than that on the regions north and south, since a portion of its weight is thrown over on either side. This fundamental principle, which has been strangely misunderstood, will be rendered evident by the annexed figure, in which *A*, *B*, represents the surface of the earth, and *a*, *b*, and *c*, *d*, the several parallel lines above, the surfaces of the strata in which the air is supposed, for illustration, to be divided. The depth of these strata will be, throughout the whole column, increased, and the surface of the upper one will be elevated above the general surface of the atmosphere. Being unsupported, it will therefore tend to flow over on the strata on each side; the surface of the next stratum below will also press outward with more force than it is pressed inward, and will consequently mingle with the air on each side, while the heavy air on each side below opposed by lighter

Fig. 7.



air will press under the lower stratum and tend to elevate it. Between the bottom and the top there will be a surface, marked *o*, which is in equilibrium.

In the middle space at the bottom of the ascending column (Fig. 6) the air will be nearly at rest, subject, however, to fitful squalls, due to the falling rain, and hence this belt is known either as the belt of rains or of equatorial calms. The width across the ascending belt is several hundred miles, and though occasionally particles of dust or infusoria, which enter on the south sides may mingle with the air which enters at the north, and thus be carried by the upward current northward, yet the habitual crossing of the two, as some have supposed, and the constant transfer of the vapor of the northern hemisphere to the southern, and *vice versâ*, is in accordance with no established principle of Nature, and therefore cannot be admitted even as a plausible hypothesis.

On account of the evolved caloric, the air in the ascending belt receives an additional momentum which carries it considerably beyond the point of statical equilibrium, and consequently it descends with a greater velocity, which is further accelerated by the cooling to which it is subjected at this high altitude, by radiating its heat into celestial space. In its descent, it brings down with it at about the average latitude of 30° the air north of this latitude, giving rise to a reverse current, and thus producing two separate systems, *A* and *B*, (Fig. 5.) The air at the foot of the descending belt at the latitude of 30° will press with greater weight than that of the average of the atmosphere; hence in this belt, at the surface of the earth, the barometer will stand higher, and while the belt of rains is called the middle belt of low barometer, the belt 30° is frequently known as the belt of high barometer. At the foot of this belt, the air will be pressed out to the northward and southward; to the southward to supply the trade winds and the air which ascends at the belt of calms, and northward to form the current from the southwest, exhibited on diagram *A*, Pl. VIII., which is the prevailing wind of the north temperate zone.

We have thus seen that there would be a tendency to separate into the two systems, *A* and *B*, (Fig. 5.) There would also be a tendency of the remaining air to separate at the point *g*, giving rise to the polar system *C*. Were the air within the circle of 60° north latitude entirely isolated from the other part of the atmosphere, a circulation would take place in this such as is indicated by *C*, the difference of temperature between the surface of the earth at the circumference of this circle and the regions in the vicinity of the cold pole would be sufficient to produce such a circulation. The column of air in the polar region, on account of its low temperature, would be denser and consequently heavier than the surrounding air; it would therefore sink down and spread out in every direction from the centre of the column, the air would flow in above to supply the level, while below, as the current passed southward, it would become heated and rise as shown at the point *g*. In its ascent it would tend to carry up with it the surface air of the system *B*, and thus conspire with the downward motion at *f* to produce the circulation shown in system *B*.

The upward current at g, as in the case of the upward current at the equator, will tend to diminish the pressure of the air and produce a low barometer and an abnormal fall of rain, which, perhaps, will be more effective in helping on the circulation of the system *B* than the mere mechanical effect of the uprising of the current of *C*. The current at the surface of the earth in the system *C*, as is shown on diagram *A*, Pl. VIII., will curve to the westward, on account of the increased rotation of the earth, and will, therefore, be almost in direct opposition to the system *B*. If we attentively consider the effect of the rotation of the earth on the system *B*, we shall find that as the current passes along the surface to the northeast, as indicated in diagram *A*, it will begin to ascend when it comes near the parallel of 60°, retaining, however, its easterly direction, will gently curve round and pass southward as an upward current, and flow toward the equator as an upper northwest current, shown on the diagram by the larger arrows, indicating a northwest wind. The system *A* is the constant circulation of the trade and anti-trade-winds. The system *C*, as we have seen, depends upon a similar cause, and is, for a similar reason, permanent in its character. Though but comparatively few observations have been made in the polar regions, the character of this system does not rest upon mere inference from the general principles we have given, but is conclusively established by the immediate results of reliable data. Professor Coffin, in his valuable paper published by the Smithsonian Institution, inferred the existence of this system, independent of theoretical conclusions. From the reduction of all the observations he was able to obtain, he conclusively proved that the resultant wind from the pole was from a northeasterly direction, and the same result is established by the discussion of the interesting series of observations made during the last expedition of Dr. Kane. These observations, which have been reduced at the expense of the Institution, under the direction of Professor Bache, by Mr. Schott, of Washington, give the same direction to the northern current at the surface of the earth within the polar circle.

That the prevailing motion of the system *B* is in the direction exhibited by the arrows, is abundantly shown by the fact of the prevalency of the southwest wind, particularly in the summer, over the whole of the temperate zone; and that this upper current of the same system is southward and eastward, or, in other words, from the northwest, is attested by aeronautic observations in this country and in Europe. The celebrated American aeronaut, Mr. John Wise, assures the writer that, from the experience of upwards of two hundred balloon ascensions, he is able to state that, while the current at the surface of the earth is from the southwest, at a variable elevation of two miles or less, the wind becomes nearly due west, and at a still greater elevation it blows from the northwest. The direction of the intermediate stratum is probably due to the resultant action of the two, and this would naturally result from the almost constant action of ascending currents, passing with every fall of rain from the lower to the upper. A similar testimony is given for Western Europe by the aeronautic experience of Messrs. Green and Mason. According to this, though

the prevailing wind at the surface is from the southwest, at an elevation of 10,000 feet, the current is invariably from some point north of west. Moreover, observations on the direction of the ashes of volcanoes prove the same direction of the upper current. In the summer of 1783, the smoke of an eruption of a volcano in Iceland was diffused over England, Germany, and Italy. From another eruption of a volcano in the same island, in 1841, the ashes were carried by a northwest upper current and deposited on the decks of vessels in the Irish Channel.

Though the prevailing direction of the currents of the system is, as it is given in *B*, in Fig. 5, yet the stability of this system is by no means equal to that of *A*, or even that of *C*, since its direction is, apparently, in some cases, entirely reversed. The northwest upper current, mingling, perhaps, with the polar current, descends to the surface of the earth, particularly along the Continent of North America, and, probably, gives rise to the phenomenon known by the name of the Northers, and also, perhaps, to the more violent northeast storms of the coast. While the reversal of this system takes place in one part of the earth, it may continue its habitual motion in another, and in this way a mild winter in America, produced by a prevalence of south-westerly wind, may be accompanied with a severe winter, produced by northwesterly winds in some part of Asia or Eastern Europe.

The belts and systems we have described are not stationary, but move north and south in different periods of the year with the varying declination of the sun. For example, the belt of rains is constantly almost directly under the sun, and moves north and south with the changing declination of that luminary, and thus divides the year in the tropical regions into two rainy and two dry seasons. The rain is produced, as we have abundantly shown, by the condensation of the vapor carried up by the ascending current of air; the dryness on each side of this belt is the result of the descent of the air which has been thrown out above, principally deprived of its vapor, and increased in temperature both by the heat due to condensation and to that absorbed before it is thrown outward from the precipitated vapor. In the summer season, when the sun is on the northern side of the equator, the trade-wind system extends up on the ocean sometimes as high as 40°. A similar movement takes place, but to a less extent, in the system of the temperate zone. From this movement it is evident that there is not only a variation of heat, but also of moisture and precipitation at different seasons of the year.

It is also necessary to mention that the belt of high barometer is interrupted across the continent of North America, and probably never passes further north than the portion of the United States bordering on the Gulf. But on this point, we cannot speak positively without more data and further investigation. It is certain, however, that on the Pacific side, the belt of high barometer, or that from which the air flows out on each side north and south, in summer extends beyond the latitude of 40°, and thereby produces a wind

from the north in this season of the year, while in winter it is found below Southern California, and thus gives rise along the coast and the parallel mountains of the interior to a wind in the opposite direction, namely, from a southern point of the compass

This is a sufficient explanation of the rain which falls at that season, since the currents from the south are laden with moisture, which they deposit in their ascent along the slopes of the mountains towards the north.

On the drawing exhibiting the surface currents, (Pl. VIII.,) the point *P*, representing the geometrical pole, is not the centre of divergence of the aerial currents which settle down in this region. The latter centre is that of the cold pole, which, probably on account of the unequal distribution of land and the currents of the ocean, does not coincide with the former.

CLIMATE OF THE UNITED STATES.

An application of the general principles we have given will enable us readily to comprehend the peculiarities of the climate of the United States, and to see how it must differ from that of other portions of the globe.

In order, however, to this application we must briefly recall what we have said in previous Reports on the circulation of the waters of the ocean, since they have a powerful influence in the distribution of heat and the modification of different climates of the earth. For the more definite comprehension of this we have had prepared diagram *B*, Pl. VIII., on which the direction of the principal currents of the northern hemisphere are denoted by arrows; and in explanation of these we shall briefly recapitulate the general theory of the cause and motion of these currents.

If the equatorial regions of the earth were entirely covered with water the trade-winds blowing on each side and acting on the water would produce a current toward the west, encircling the whole globe; but since the region of the equator is crossed by continents, the continuous current we have spoken of is broken up and deflected right and left into extended circuits; the water blown from the coast of Africa along the region of the equator westward is divided into two currents, one direct northward and the other southward by the projecting part of South America. The northern branch, as shown by the arrows, passes through the Gulf of Mexico, and, impelled by the action of the surface wind and the rotation of the earth, makes a complete circuit, returning into itself along the coast of Africa, leaving in the centre a large area of stagnant water covered with weeds, and known by the name of the Sargosso Sea. The entire course of the waters in this extended circuit is completed in about three years. In the Atlantic Ocean a branch is sent off from this circuit, which passes northward, impinges on the western coast of Europe, and probably skirts the whole circuit of the polar basin, from which it passes out on the west side at Bhering's Straits.

Two similar systems of currents exist in the Pacific Ocean; that in

the northern hemisphere, passing from Central America along the equator to the continent of Asia, is deflected northward along the coasts of China and Japan, and returns to the equator along the western coast of North America.

Besides these great circuits from the equator, cold currents descend from the polar basin. One of these is represented by the arrows with double barbs between the Gulf Stream and the eastern coast of the United States; and a similar one descends along the coast of China between it and the Gulf Stream of that region. These are in part derived from the water which is discharged into the polar basin from the several rivers of the north, and probably in part due to a return portion of the equatorial currents. They skirt the eastern shores of the continents, because currents from the north, on account of the rotation of the earth, tend to move westward, while those from the south tend to move eastward.

The effect which these great currents of the ocean, evidently the natural results of the system of winds which we have described, produce on the climate of the United States, compared with that of Europe, can readily be appreciated. The elevated temperature of the water in the Gulf of Mexico, which is greater than that of the water in almost any other part of the globe, is retained by the Gulf Stream until it reaches the shores of the polar basin. The southwest winds which accompany and blow over the Gulf Stream share its temperature, and impart their warmth and moisture to Western Europe, giving it a climate far more genial than would be due to the latitude. The southwest and westerly winds which prevail over the surface of the United States serve to bear the heat of the Gulf Stream from our coast, and even when an easterly wind is produced by local causes, which would bring the warm air of this stream to our shores, it is cooled by crossing the cold current we have mentioned, which reduces its temperature to the dew-point, and produces the peculiar chilly effect so familiar to the inhabitants of the Eastern States during the prevalence of a northeast storm. While, on the Pacific coast, the west winds from the ocean cross the comparatively cool current from the north, and impart their mild and uniform temperature to the western slope of the coast range of mountains, giving rise to the remarkable fact of the summer temperature being the same for hundreds of miles in a north and south direction.

Were the whole of North America, from the Atlantic to the Pacific, a continuous plain, or were the surface diversified merely by eminences of comparatively small elevation, the moisture from the Pacific would be carried into the interior, and a much greater degree of fertility in the western portion of the Valley of the Mississippi would exist. In the actual condition of the Continent, however, the westerly wind which passes over the great mountain system, which extends from north to south along the western portion of the Continent, principally deposits its moisture on the western slope of the coast range, and gives fertility and a mild climate to California, Oregon, Washington, and particularly to the regions further north. The

amount of rain which falls at Sitka, Russian America, amounts in some years to 60 inches. The remaining moisture which this westerly wind may contain is precipitated on the western slopes of the high ridges farther east, and when the current has passed over the whole Rocky-Mountain system, it is almost entirely dessicated, and leaves the elevated plains east of the Rocky Mountains an arid region, so deficient in moisture as to be unfit for cultivation, unless by the aid of irrigation, with the exception of occasional oases and along the borders of streams.

We have seen that two great systems of wind prevail over the United States, the upper from the northwest and the lower from the southwest. The latter carries the moisture from the Gulf of Mexico and the Carribean Sea over the whole of the Eastern States of the Union, and the eastern part of the Valley of the Mississippi, and is therefore the principal fertilizing wind of the interior of the Continent. Were the earth at rest this wind would flow directly northward, and would diffuse its vapor over the whole interior of the country to the base of the Rocky Mountains; but on account of the rotation of the earth it is thrown eastward, and bears its moisture in a northeasterly direction, leaving a large space, as it were, under the lee of the Rocky Mountains, greatly deficient in this element of vegetable production.

These winds are shown on the map of the United States, in Pl. VII., which is copied in its principal features from a large map compiled at the expense of the Smithsonian Institution. In so small a map it is impossible to be accurate in the minute divisions. It will serve, however, to exhibit, at a glance, the relative proportions of the principal meteorological regions of the country. The upper strata or northwest winds are denoted by the heavier arrows, with a circle on the end, and the lower surface or fertilizing wind by the finer arrows. The dark portion of the map indicates the naturally woody regions of the country, well supplied as a whole with moisture from the fertilizing winds; the lighter shaded parts indicate rich arable prairie, along the streams of which, where there is a local supply of vapor, wood is found, but as a whole has much less moisture than the naturally woody portions. The unshaded or white part of the map, within the boundary of the United States, indicates the regions so deficient in moisture that no dependance can be placed upon them in regard to agriculture. In some parts of them, where moisture is found, crops may be produced, but as a whole, they are of little value in the way of affording the necessaries of human existence, and incapable of sustaining other than a very sparse population. Portions of this unshaded part, on account of the nature of the soil, are barren and almost destitute of vegetation, while other parts, when occasionally watered by a fitful shower, yield patches of grass, to which the buffalo by his instinct is directed, but which in the course of a few weeks are almost reduced to a powder by the drying influence of the unscreened rays of a powerful sun. Even the vapor which arises from the evaporation of the rain which may fall on the regions indicated by the unshaded part of the map is constantly

carried eastward instead of being precipitated again on the place whence it arose.

The direction of the several ridges of the Alleghany Mountains is parallel to that of the fertilizing wind, and hence these do not materially interrupt the southwestern currents, and they are consequently sufficiently supplied with moisture, except in the more elevated valleys which are inclosed by a ridge at their southern extremities.

From the fact, abundantly proved by observation, that the vapor of the Pacific Ocean does not pass over the elevated crests of the Rocky Mountain system, it must be evident that the idea that the supply of the interior of the North American Continent comes from the Southern Pacific by ascending to the cold regions of the top of the belt of rains is entirely untenable. The source from which the moisture of the interior is derived is principally the Gulf of Mexico. We shall endeavor to give in a subsequent Report an account of the climate of the several meteorological districts into which the United States may be divided; the remaining space allotted to this article will be devoted to a brief exposition of the storms of the Continent.

Storms of North America.—The two great systems of winds, to which we have so frequently alluded as existing over the United States, present their meteorology in a simple form and on a very extended scale, while the general features of the phenomena of American storms are readily explicable on the principles of the theory propounded by Professor Espy. And first we may remark that on account of the height of the mountain system between the Valley of the Mississippi and the Rocky-Mountain slope, the storms or other commotions of the atmosphere which take place on the western side, are seldom, if ever, communicated to the air on the eastern, and this is a natural consequence of the principle which refers these commotions to the evolution of the latent heat from portions of air charged with moisture. An intervening region almost entirely without moisture will of necessity, according to this view, tend to intercept the progress of a storm, though it is not impossible that the drawing in of air on one side of a mountain of limited extent may cause a current across the mountain to supply the deficiency.

We think all the phenomena of the storms of the interior of this Continent may be referred to disturbances in the equilibrium in the upper and lower strata of air. In the first place, all the disturbances of the atmosphere, however they may be produced, tend to move eastward over the United States, because this is the resultant motion of the great mass of current passing over the surface of this region. That the storms from the interior tend to move nearly east, with a velocity of from 20 to 30 miles an hour, is abundantly proved by the observations collected at the Smithsonian Institution, and the fact is interestingly and practically exhibited by means of the daily despatches gratuitously furnished this Institution by the Morse line of telegraph. These despatches are received every morning from the greater portion of the country east of the Mississippi River, and to render the information available in the way of predicting the changes of the weather

which will probably take place during the day or the following evening, a large map, containing merely the names of the places of observation, is attached to a wooden surface, into which, at each place, a projecting iron pin is driven. An assortment of cards of about an inch in diameter, of different colors, to indicate rain, snow, clearness, and cloudiness, having been provided, are attached to the map at the respective places of observation by means of the iron pins, and changed daily to correspond with the telegraphic despatches, so that an observer, at a glance, may see the condition of the weather at any portion of the country before mentioned. During the autumn, winter, and spring, if in the morning the visitor to the Institution observes a black patch indicating rain at Cincinnati, he may conclude that, in about twelve hours afterward, the same storm will reach Washington. Indeed, so uniformly has this been the case during the last year, that we have been enabled to decide whether it would be proper to advertise during the day the lecture to be given in the evening.

In summer it frequently happens that thunder storms commence their course at intermediate points between Washington and Cincinnati, and therefore it will not always follow that a clear sky in the morning at the latter place will indicate a clear evening at the former. But, wherever the thunder storm commences, it always moves eastward, or rather eastward inclining to the north, a direction which indicates that the direction of these circumscribed storms is principally governed by the motion of the lower stratum of air.

The extent of the interior storms, north and south, is exceedingly variable. In some cases a storm of not more than a hundred miles in width travels eastward along the lakes; and again, at another time, a storm of a similar width may commence at the south, and move along the shore of the Gulf of Mexico. Again. at other times, the commotion appears to extend from some point at the north in the British possessions to the Gulf of Mexico, and even further south, and to move side foremost eastward. In this motion the southern part of the storm first reaches the Atlantic Ocean, in the southeastern part of Georgia, and, since the general bend of the coast is to the northeast, it is evident that the storm will appear to move from south to north along the coast, while in reality the whole system of disturbance is moving eastward, and will leave the Continent last at Newfoundland.

There is another system of storms, which appears to be principally confined to our coast, produced by disturbances in the interior, which tends to draw in, as it were, along the surface, to be carried outward again by the upper current, the air from the Gulf Stream, which gives rise to our northeast storms; which, however, in a great degree, are intercepted by the Alleghany Mountains, and do not extend very far into the interior. These storms appear to commence at the south, and according to a suggestion of Dr. Hare are due to a rarifaction of the air in the Gulf of Mexico, to which may also be attributed the Northers which descend from the Western plains to the heated regions of the same gulf.

There is another system of storms which have their origin in the

Carribean Sea, and follow the general direction of the Gulf Stream, and sometimes sweep over the projection of Florida and overlap a portion along the eastern coast of the United States. These are the great hurricanes, or cyclones. as they are sometimes called, the character and nature of which have given rise to so much discussion.

During the warm months of summer almost every part of the United States is occasionally visited with very violent, though exceedingly circumscribed, commotions of the atmosphere, known as tornados or water spouts. These generally move in nearly the same direction, towards the northeast, except perhaps on the borders of the Gulf of Mexico, leaving their narrow path, sometimes only a few rods wide, marked with the evidence of the energetic action of a most destructive force. The question naturally arises, is it possible, in the present state of science, to give a rational explanation of the various phenomena exhibited in these apparently fitful and complex commotions, apparently without an adequate cause in the light and scarcely visible aerial covering of our globe? Can the question be answered? How is it possible that the soft and balmy air, which offers scarcely the least resistance to the motion of a lady's fan, can yet exert a power sufficient to level with the ground the largest trees of the forest at the rate of 7,000 in the space of a mile, in a single minute, and this destructive energy continue, as it has been known to do, for a distance of many miles?

The phenomena of these violent circumscribed storms, which appear almost peculiar to America, have been investigated with much careful and laborious research by Franklin, Bache, Loomis, Olmsted, Hare, Redfield, Espy, and others. We owe to the lamented Professor Mitchell, of North Carolina, valuable suggestions in regard to the motions of the air in storms of this character. Professor Bache was the first to make an actual survey of the track of a tornado, and to protract on a chart the relative position and direction of the prostrated trees and the lines described by bodies which had been moved by the force of the wind. Mr. Chappelsmith, of New Harmony, Indiana, has furnished the Smithsonian Institution with an account of a tornado and a map of its path, on which are delineated, from actual survey, the position and direction of several thousand trees. Professor Loomis has also minutely described the effects of a number of tornadoes, and has besides investigated, with much care and extended research, the phenomena of several large storms. He was the first to adopt the system of preparing a series of maps, illustrating the phases of the storm at different periods.

The laborious observations of the lamented Mr. Redfield, particularly in regard to the hurricanes of the Atlantic Ocean, have intimately connected his name with the history of meteorology, while the theoretical expositions, which have so long occupied the attention of Mr. Espy, have done admirable service to the cause of the same branch of knowledge.

The controversial papers of Dr. Hare, bearing evidence of his great logical powers, served to give precision to the views of those engaged

in these investigations, and thus to eliminate error as well as to advance the truth. In speaking of those who have given interesting expositions of the general facts of the meteorology of North America, we ought not to omit to mention Mr. Robert Russell, of Scotland, who visited this country a few years ago, and who has since published a work on the agricultural resources of the United States and its meteorology, which is alike characterized by accuracy and sagacity of observation, as well as by candor and justness of opinion.

The facts which have been gathered from the researches of those we have mentioned, as well as from other sources, ought to be sufficient to furnish an induction of the principles on which these phenomena depend; and although no theory at a given time in the history of a progressive science can be considered as perfect, yet we believe the general principles on which the disturbances we have mentioned depend have been successfully developed by Mr. Espy; and though in subordinate particulars modifications will be required, yet we think the general propositions of his theory will stand the test of time.

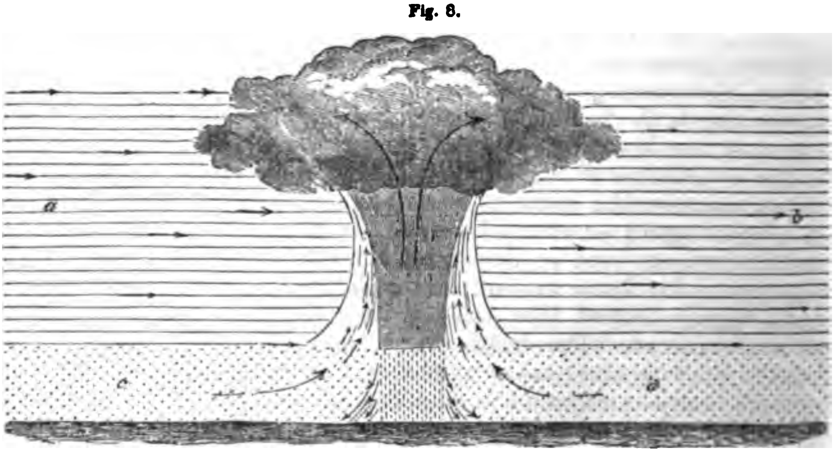
As a general rule, previous to the commencement of an extended storm during winter, the surface current is from the southwest or some southerly direction, the temperature rises, and the pressure of the air diminishes as indicated by the fall of the barometer. This state may continue for several days, and we think it is produced by the southerly current increasing in quantity, in velocity, and depth, thereby rendering the stratum of air next to the surface of the earth abnormally warm and moist, and consequently lighter, while the upper current remaining the same the atmosphere above the surface of the earth gradually assumes a state of tottering equilibrium. This condition, according to Mr. Espy, is not brought about by the gradual diminution of the density of the lower stratum, but by the increased density of the upper strata, due to the radiation into space of the latent caloric which had been evolved during a previous storm. We think, however, that both causes are operative. This instability or tottering equilibrium will first take place at the Far West, on the Western plains east of the Rocky Mountains, since, as we have said before, the commotions on the western side can slowly be propagated across the high mountain system. A storm then consists of the ascent of the lower current into the upper and the gradual transfer of the commotion of the air eastward. To take the simplest case, let us suppose the storm to be of circumscribed character, like that of a water spout or thunder storm. In this case, after the unstable equilibrium has been produced, the slightest disturbance, such as the passage of the lower current over a slight elevation, or over ground more highly heated than the adjoining, will tend to establish an upward current. The light, warm, and moist air below will be buoyed up with great rapidity, and as it ascends will come under less pressure and will expand into a larger bulk. If [illegible] perfectly dry it would again be in equilibrium, its bulk would be increased, its density would be diminished to that of the air to which it had ascended, and its temperature would be the same as that of the surrounding

stratum. But since it contains moisture, and in expanding becomes colder, a portion of the vapor will be condensed, and in this condensation will give out its latent heat. Hence the air of the column will be warmer than that of the surrounding atmosphere; it will consequently rise to a greater height, again expand, again become colder; another portion of vapor will be condensed, and another amount of latent heat evolved, and so on; the air will rush up with an accelerated velocity, and probably gather momentum sufficient to carry it to a height greater than that due to its buoyancy alone. The condensed vapor will fall in rain through the base of the cloud; on either side the air of the storm will be forced out from the uprising column into the surrounding air, and while the pressure at the base of the column will be diminished that on each side will be increased; hence the barometer will be frequently found to rise slightly before the approach of a storm and to sink rapidly as the centre of the uprising column approaches the place of observation.

A series of observations have been made at the Smithsonian Institution to determine the variations of the barometer during the passage of thunder storms, and in every case in which observations of this kind have been obtained, a sudden fall has been observed in the barometer, and at the moment of the descent of the rain a slight elevation, followed again by a depression, and then a rise, until the normal pressure of the day, or perhaps a little greater, has been obtained. The intermediate rise taking place at the moment of the fall of the rain, may be properly attributed to the momentum of the drops as a sufficient cause.

Fig. 8 is intended to illustrate the conditions and phenomena of a commotion of this kind. The dotted space, *c*, *d*, below represents the lighter atmosphere, consisting of the warm southwest current surcharged with moisture; the parallel lines, *a*, *b*. above and the arrows indicate the direction and position of the upper western current.

Fig. 8.



The ascending column is represented by the perpendicular lines, and the shaded portion above exhibits the cloud formed by the condensed vapor which is thrown outward on each side above. The rain falling in

the axis of the uprising column, by its weight, forces out the air in the direction of the arrows at the foot of the column.

When the air is saturated with moisture in warm weather, and especially when the sensation called closeness is observed, the rushing up of the column through a confined space may be so violent that drops of water may be carried up beyond the point of congelation and be converted into ice, and these will be thrown out on each side, exhibiting the phenomenon, often observed in storms of this character, of two streaks of hail along the course of the tornado. In some cases, these pieces of frozen water will be caught up by the inblowing air below, and be carried up again, perhaps, several times in succession, each time receiving new accretions, and thus large hail stones will be formed exhibiting a concentric structure, in which the centre will be of a light spongy consistency, and this succeeded by a stratum of transparent ice, and this again by another stratum of snowy appearance, and so on, the outer surface being covered with large projecting crystals of solid ice. These facts are in strict accordance with what we might have predicted from the theory we have adopted. If several large drops of water come in contact, and, by their attraction, rush into one larger drop, and if this be borne up so high that it begins to freeze, crystallization will commence at the surface, and the air in the water will be driven inward as the solidification proceeds, and, when the freezing is completed, it will give a spongy appearance to the nucleus of the hail stone. As the hail stone is carried up a second time it will gather in its ascent another quantity of water, which will again begin to freeze, and produce the spongy envelope, inclosing the stratum between it and the coat of pure ice, surrounded by a stratum of solid ice, and so on. The number of concentric envelopes will indicate the number of times the hail stones have been carried up, and the collision of the stones in their ascent and descent will give rise to the peculiar noise which is heard during the passage of a storm of this kind.

The ascent of bodies in the centre of the upmoving column, and their being thrown out at the top, is not a mere matter of speculative inference, but rests upon direct observation. Bodies are seen to be carried up in the middle of the ascending column, and thrown out as we have described; but, above all, Mr. Wise, the celebrated aeronaut, gives an account of what took place on the occasion of his balloon being drawn in the ascending column of a thunder storm. The balloon was carried up to a great height, thrown out on one side, sunk gradually down, was caught again by the inblowing current, which was rushing in to supply the column, again violently carried up, and again thrown out, and this several times in succession.

We have here, in accordance with the theory of Mr. Espy, a true, simple, and sufficient explanation of the production of hail, which takes place in the hottest and most sultry weather, and when the air is most highly charged with moisture, and consequently when it contains the greatest amount of latent ascensional power. The vapor which ascends is derived from the moisture which a short time before

existed at the surface of the earth, and since the ascending column usually carries up with it a quantity of fine dust, gravel, pieces of leaves, &c., these are found in the nucleus of the hail stones.

In order that a storm of this kind may be attended with hail, it is necessary that it be of considerable violence, in order that the drops of water be carried up to a sufficient height, and hence, as we have said before, this phenomenon occurs usually in the warmest and most sultry weather.

The writer of this article is enabled to give the foregoing explanation of the nucleus and the alternate spongy layers of large hail stones from the effects he obtained by freezing water in a glass bulb. The freezing commenced at the exterior surface, to which the axes of the crystals were at right angles. The air contained in the water was forced in before the advancing crystallization, and formed at the centre of the globule a spongy mass precisely similar to that which formed the nucleus of the hail stone.

When the uprising column assumes the form of a tornado, it is more circumscribed, and is, we think, generally accompanied by a whirling motion. The power of the current, however, is in an upward direction. The gyration is an accidental circumstance, while the upward motion is an essential one; and the whole power of the tornado to produce mechanical effects is in this direction; hence, as it passes along over the surface of the earth, and air flows in on every side to supply the upmoving column, trees are drawn in, as it were, and thrown with their tops towards the path of the tornado. The writer had an opportunity, on one occasion, of examining, with Professor Bache, the effects of a tornado, or land-spout, after it had passed through an orchard. The trees were all prostrated in a strip of about four rods in width, with their tops inward toward the middle of the path. The whirling tends to contract the dimensions of the column, and to give it the peculiar appearance of an inverted cone descending from the clouds. The air which rushes within the revolving cylinder, charged with moisture, is immediately expanded, consequently cooled, and its vapor condensed into visible clouds, which gives rise to the peculiar appearance of the descending trunk.

The tremendous ascensional power which is exhibited in storms of this kind, although almost exceeding belief, is nevertheless, in accordance, with the established dynamical principle of the accumulation of momentum in cases of the continued action of a constant force. We are all familiar with the velocity given to an arrow, by a simple propulsion of the breath along the interior of a blow-gun. In this case the air presses against the end of the arrow, at first with just sufficient force to move it; but the momentum it has thus acquired is retained, it receives another pressure from the air, retains the effect of this, and so on, until it leaves the other end of the tube with the accumulated momentum acquired during its whole passage through the interior of the gun. In the same way the air, as it approaches the uprising column below, commences its ascent with an amount of momentum which is constantly increased by continued

pressure behind. The ascensional momentum therefore becomes so great as to furnish a ready explanation for all the exhibition of mechanical power which is so frequently witnessed in storms of this character in our climate. On account of the rarefaction of the air in the centre of the storm in cases where it has passed directly over head, buildings are instantly unroofed, the sides are thrown outward, as if by the action of gunpowder, chests are broken open, and corks forced from empty bottles, in which they have been tightly fitted. In these cases the outward pressure being, in part, removed, the unbalanced repulsive energy of the atoms of the air within the edifice causes the outward explosion. The force of this outward tendency will not be surprising when we reflect upon the great pressure of the atmosphere in its normal state, which is equal to more than 2,000 pounds on every square foot of surface, and which frequently and suddenly experiences a reduction of a twentieth part of at least this amount, or, in other words, of 200 pounds to the square foot—an unbalanced force abundantly sufficient to produce the effects we have mentioned.

Dr. Hare attributed the violent upward motion of the air in tornadoes to a peculiar electrical state of the atmosphere in which, while the air was highly positive, the earth was negative, and the bodies carried up were repelled from the earth and attracted by the cloud, as in the case of the dancing figures between the two plates, one of which is connected with the prime conductor of an electrical machine and the other with the earth. We think, however, with Mr. Espy, that electricity is altogether a collateral result—an effect of the storm and not its cause; it is probable, however, that its presence tends to modify the appearance and produce phenomena of a subordinate character. It is well known that when a kite is sent up to a considerable height above the earth, to which is attached a metallic string, the latter becomes highly charged with electricity, even in a clear day, when not a cloud is visible; this effect is due to what is called induction. The positive electricity of the upper atmosphere drives the natural electricity of the wire from its top to its bottom; hence the upper end of the wire will be negative and the lower end positive; a similar effect must be produced on the cloud formed by the uprising column and on the column itself, the two form a continuous conductor of immense height, and hence, like the wire, must become charged at the lower end with positive electricity of great intensity, which will tend to elongate the trunk downwards by repulsion, and which will give occasional discharges to the earth as the tornado passes over good conducting substances.

The terrific and appalling grandeur of the tornado strikes the beholder with astonishment and awe; now pausing fitfully as if to select with malignant caprice the objects of its unsparing violence; now descending to the earth, and again drawing itself up, with its deep, loud, and sullen roar; its mysterious darkness; its apparent self-moving, resistless revolutions; carrying upwards branches of trees, beams of houses, and large objects of every description; its im-

petuous downward rush to the earth. and then again up to the sky; its sublime altitude, sometimes erect and at other times inclined; its reeling and sweeping movements; all these, and more, to be adequately conceived must be actually witnessed.

The thunder storm differs from the tornado in its less concentration, and, consequently, in the less intensity of its violence. It occurs usually in the United States in the after part of a sultry day, when the air has attained its maximum amount of vapor, and has, therefore, assumed a state of tottering equilibrium. These storms are usually produced over a considerable extent of country on the same day, and occur nearly at the same hour for several days in succession, and probably serve to restore a more stable equilibrium to the air, and thus perform the office of the great winter storms which sometimes regularly succeed each other at given intervals. Their general course is eastward, but they sometimes deviate from this direction to a certain extent, apparently on account of the attraction of water courses; they partially exhaust, carry up and precipitate the moisture of the atmosphere, but sometimes leave the air immediately afterwards in a sultry condition. We hope to be able to give in another article an exposition of the electrical phenomena exhibited by thunder storms, but we may mention here the fact of the almost instantaneous fall of rain after each peal of thunder. It has been supposed that the drops of rain in this case were produced by the agitation of the discharge of lightning; but a little reflection will render it evident that the rain must have commenced its rapid descent before the discharge took place, since it follows the flash at so short an interval that we must suppose that it commenced to fall previous and not subsequent to the discharge; it is more probable that the fall of rain, on account of offering a conducting medium for the electricity, is the cause and not the consequence of the discharge in question.

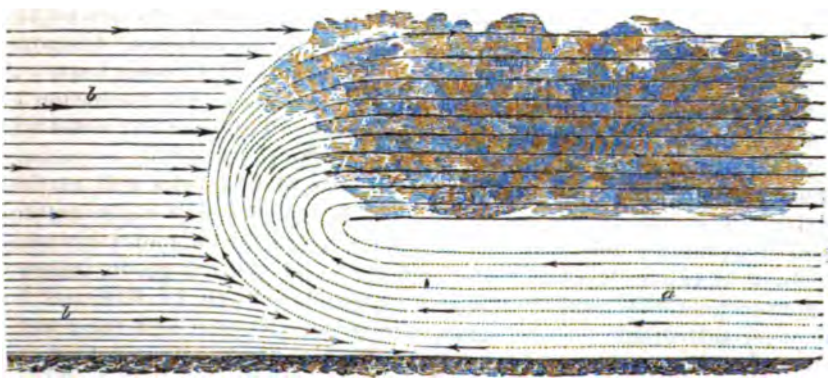
The great interior storms we have mentioned usually commence at the Far West, even at the base of the Rocky Mountains, and generally occur in November, December, January, February and March. They are sometimes of great extent in a north and south direction. One of these storms, that of 1836, which was investigated with so much ability by Professor Loomis, reached from the Gulf of Mexico to unknown regions in the north. They are of varying breadth, sometimes several hundred miles across, and the cloudiness produced frequently overspreads simultaneously a considerable portion of the eastern part of the United States.

In common with nearly all the commotions of the atmosphere on the North American Continent, they move eastward, at the rate sometimes of thirty-five miles an hour. In some rare instances the horizontal axis of the storm in a north and south direction is nearly a continuous straight line, and moves side foremost toward the east, in the form of an immense wave, or rather undulation. The pressure on the middle of this wave, on account of the uprising air, is less than the normal pressure of the atmosphere, while on either side, and particularly on the east, it is greater.

This prêssure on the front and rear of the storm is due to the spreading out above of the air which has been carried up in the ascending current, and is greater on the east side of the storm on account of the action of the westerly current, in which the whole commotion is carried forward. The approach of a storm is, therefore, generally indicated by a rise of the barometer, which is succeeded by a subsequent fall, and also by an increase of temperature due to the radiation from above of the evolved caloric, and also by the increased pressure of the air forced out above. Sometimes horizontal the axis of the storm is curved, and again, which is of more frequent occurrence, broken up into a number of separate parts, forming altogether a system of which the several portions slightly vary in direction and velocity in their motion to the east.

These great storms, though of the same general nature as the thunder storm, are attended with an entire subversion of the upper and lower strata of the atmospheric ocean. After one of them has swept over the Continent, the commotion is immediately succeeded by a westerly wind, a great reduction of temperature, and a great increase in the degree of dryness of the air. We have endeavored to give an idea of the motions of the strata of the atmosphere accompanying these changes in Fig. 9, which exhibits an imaginary section of the currents in an east and west direction.

Fig. 9.



Previous to the commencement of the storm there exists over the surface of the United States a lower stratum of air, moving from southern points of the horizon, and over this, at an elevation of two or three miles, the constant current from the west continues its habitual and uninterrupted course. The lower stratum, principally coming from the Gulf of Mexico, is abnormally warm, moist, and light, while the superstratum is in its usual condition, and the whole is, therefore, in a state of unstable equilibrium. At the Far West this lower stratum begins to be invaded by the dense air from the polar current, which, coming from the northwest and mingling with the upper current, presses under, and, turning the moist current upward, produces an ascending column, or rather wall, which. mingling with the upper current, is carried rapidly to the east. The uppor current is con-

tinued with varying energy, and by the condensation of the vapor from the lower forms clouds and rain, which are carried in advance to the east, as the whole system of disturbance is borne in the same direction by the ordinary eastward flow of the upper current of the aerial ocean. The primary lower current is shown in the figure by the stratum *a;* the upper current, which has filled the whole space on the west down to the earth, by *b b;* the portion of the primary upper current into which the stratum *a* has ascended and in which its vapor has been condensed into clouds and rain is represented by *c.*

As the storm advances eastward, it leaves the country behind it entirely covered with the westerly current, and in this way carries to the ocean before it the greater portion of the vapor with which the lower stratum, previous to the commencement of the storm, was saturated. The rain which falls at any given place is formed of the condensed moisture which existed at the surface of the earth a few hours previous in the same spot or its vicinity.

We have in Fig. 9 represented the whole cloudiness thrown eastward in advance of the storm, but in some cases, with a more energetic upward motion, a part of the ascending air will be thrown out to the west above; but this can scarcely ever take place to the same extent as on the eastern side. After the upward moving column has passed over a given place, the wind, which was previously from the east, will suddenly change to the west, the sky will become clear, and a great reduction of temperature follows. The whole effect, then, is due to the tottering equilibrium produced in the air by the introduction of moisture and the accompanying elevation of temperature, together with the subsequent evolution of the latent heat. A similar condition of the atmosphere preparatory to the formation of another storm will gradually be reproduced. The westerly wind will again be buoyed up by the warm air from the south, it will, therefore, disappear at the surface of the earth, at which a calm will at first exist, the southerly wind will increase in velocity, the thermometer and hygrometer will indicate a higher temperature and increasing amount of vapor, the barometer will fall, and after a given interval another unstable equilibrium will be produced, to be followed by another subversion of the strata of the aerial ocean and the repetition of all the previous phenomena. The intervals between two successive storms will also depend on the time of radiation into celestial space of the evolved heat, in order to reduce the upper stratum to its normal condition of temperature and density; but the time required to produce these effects is frequently in winter very nearly the same for several successive periods. For example, most persons can remember the occurrence in succession of a series of storms on Sundays. In one case, we recollect this to have taken place six times in succession. There is nothing in this particular day to induce the occurrence of a storm, but merely it will be more likely to be remembered when it happens at this time; and although the interval may not precisely be seven days between two storms, yet it may differ so

little from this that a part of the first and sixth Sundays may be included in the cycles of disturbance.

The wind, as a general rule, tends to flow towards the axis of the storm on each side, but at the surface of the earth, diversified with hills and valleys, the direction is far from being as regular as at first sight might be expected. Beside this, since the commotion of the atmosphere is usually divided into a number of separate groups, each of which having a separate ascending column or belt to which the inblowing air is directed, the arrows on the map indicating the direction of the winds generally present a very complex system of currents. On this account, also, the rain does not simultaneously fall along an extended line from east to west, but in separate places, the position of which is determined probably by the greater amount of moisture, and, consequently, the more intense action of the ascending current. As the storm, however, approaches the eastern part of the United States, the inblowing air to supply the upmoving current draws in, as it were, the air from the ocean charged with moisture, and since this is a constant supply the action may continue for several days, and, perhaps, the storm may, as it were, become stationary, giving rise to prolonged easterly currents.

It would appear, however, from observations at the Smithsonian Institution, that the northeast storms are produced by the rarefaction of air on the east side of the Alleghany Mountains, and that they are sometimes unaccompanied with a previous interior storm from the west.

A considerable number of storms have been mapped in accordance with the plan first adopted by Professor Loomis, exhibiting by different colors on the successive maps the positions and movements of the lines of equal pressure and of equal temperature. We have not, however, been able to find, except in very rare cases, the advance of the storm side foremost in a continuous line. The conditions exhibited are similar to those we have described, namely, a series of centres of commotion advancing eastward.

The next system of storms to be noticed is that which is denominated hurricanes, or cyclones, the true character or nature of which has given rise to much discussion between the advocates of the two rival theories, of an entirely horizontal gyratory motion of the wind on the one hand, and an inblowing to a central area and upward motion of the air on the other.

Much of this discussion undoubtedly arose from the want of precision in the earlier conceptions of the motions of the air, when referred to the surface of the earth, as in the case of a gyration, and in many cases to the ambiguity of the language in which these views were expressed. While Reid and Piddington supposed the motion of the wind to be in concentric continuous circles, and Mr. Espy, at first, in direct radial lines towards the centre, Mr. Redfield finally adopted an intermediate view, namely, of a spiral inward motion. We are entirely convinced, from the observations which have been collected at the Smithsonian Institution in regard to the large interior storms, that they are

not rotary, and that when the gyrations do take place, as they must in some cases on account of the inblowing currents from all directions not exactly opposing each other, the gyration is a secondary motion, the principal force being exerted in an upward direction. We are unable to conceive of any adequate cause of the great and continued velocity of the air in a circle of several hundred miles in diameter, except that which is due to the heat evolved by the condensation of the vapor with which this portion of the atmosphere is saturated. This appears to me to be the true and sufficient source of the great motive power, and to afford, when connected with the rotation of the earth, a complete explanation of all the phenomena. These storms, as we have said, commence in the Caribbean Sea, and describe a curve on the surface of the earth almost precisely the same as that which would be exhibited by a projection on a horizontal surface of the path described by an atom of air in its ascent at the equator, in its passage westward, and in gradually curving round toward the east. Mr. Redfield has shown that these curves, in whatever longitude of the northern hemisphere the hurricanes have occurred, are precisely of the same character.

If it be admitted that the motive power of this violent commotion of the atmosphere is due to the evolved heat of the moisture of the air, it will follow that they will be most frequent and of greatest intensity in portions of the earth in which the relative amount of moisture is greatest, and that they will therefore be found in the greatest number in the heated and moist air which is directly over the Gulf Stream. The atmosphere in this locality must be, in the highest degree, in a state of tottering equilibrium, since the air rising from the heated surface along the axis of the stream must be much more highly charged with moisture than that on either side.

These storms sometimes overlap the eastern coast of the United States, and produce great destruction of property along the seaboard, and frequently a loss of life and shipping in the region of the Gulf Stream.

Hurricanes of the same character are found in the southern hemisphere, describing similar curves, which turn, however, south from the equator round to the east, in an opposite direction to that of the curves described by the hurricanes of the northern hemisphere. The space to which we are limited in this article precludes a more minute discussion of the phenomena which have been observed and the opinions which have been adopted in regard to these storms. We may, however, have an opportunity of resuming the subject on some other occasion.

In this paper, we have endeavored to give an exposition of the general principles of the meteorology of the United States, reserving for a future Report a more detailed account of the climatology of its different portions. We have especially endeavored to exhibit our views of the theory of Professor Espy, and to show its applicability to the explanation, and, in some cases, to the prediction, of the great commotions of the atmosphere. We think this theory has not received the attention from foreign meteorologists which its merits demand, and this,

perhaps, has arisen from the fact that it has not been presented to the public in a form which would commend it to the immediate attention of scientists. It has been frequently coupled with propositions for the artificial and economical production of rain, which, however well based on scientific principles, would be too uncertain and too expensive to render them of any value in a practical point of view; and it must be confessed that the language of Mr. Espy in regard to the proofs of the truth of his theory, and of its great value as a scientific generalization, have been such as to awaken opposition rather than to secure attention and final adoption.

MEAN AND EXTREME TEMPERATURES, WITH THE AMOUNT OF RAIN FALLEN AT DIFFERENT POINTS, DURING THE YEAR 1858.

ALLIGATOR, FLORIDA.

Latitude, 30° 12′ N.; longitude, 82° 37′ W. from Greenwich; elevation above tide-water, 174 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, March 10; earliest frost in autumn, November 10; period without frost, 244 days. Observer, E. R. IVES.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	58.1	55.2	60.1	70.8	76.1	81.5	81.7	80.8	75.8	73.3	55.8	61.8	69.95
Therm'r, extremes	78	82	80	96	95	97	97	100	90	90	82	82	....
	38	30	27	50	60	68	72	70	58	56	32	38	....
Rain, inches........	6.1	6.1	6.5	3.0	3.83	5.83	12.33	8.0	14.0	3.7	5.6	4.7	79.69

ALL SAINTS, SOUTH CAROLINA.

Latitude, 33° 40′ N.; longitude, 79° 17′ W. from Greenwich; elevation above tide-water, 20 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 28; earliest frost in autumn, November 10; period without frost, 195 days. Observer, Rev. ALEXANDER GLENNIE.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	52.14	45.56	52.42	64.62	71.72	77.74	80.28	80.48	73.01	68.56	49.22	54.36	64.18
Therm'r, extremes	69	71	79	83	87	86	89	89	85	82	76	74	....
	35	32	24	41	61	67	69	71	54	52	28	31	....
Rain, inches........	4.93	7.97	1.03	3.90	3.51	1.51	11.32	3.33	5.37	3.4	3.01	1.77	51.14

ANNAPOLIS, MARYLAND.

Latitude, 38° 58′ N.; longitude, 76° 29′ W. from Greenwich; elevation above tide-water, 20 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 26; earliest frost in autumn, November 7; period without frost, 194 days. Observer, WILLIAM R. GOODMAN.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	40.66	31.4	40.36	53.4	60.37	76.21	79.3	75.47	67.6	59.27	42.7	39.49	55.32
Therm'r, extremes	58	49	71	84	81	94	97	92	85	86	63	57	....
	25	12	9	34	49	57	65	57	47	33	22	15	....
Rain, inches........	1.79	1.69	0.7	4.43	6.75	1.95	1.8	3.17	2.31	3.36	5.03	5.61	38.59

APPLETON, WISCONSIN.

Latitude, 44° 10′ N.; longitude, 88° 35′ W. from Greenwich; elevation above tide-water, 800 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 25; earliest frost in autumn, August 20; period without frost, 116 days. Observer, Professor R. Z. MASON.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Thermometer, mean.	29.18	16.99	35.11	42.89	59.45	70.06	71.37	68.65	60.58	48.95	32.98	22.53	45.86
Therm'r, extremes	49	44	66	74	74	95	89	92	82	77	47	40	....
	–7	–13	0	25	37	48	54	45	32	31	10	–18	....
Rain, inches........	1.25	0.33	1.87	4.57	5.4	4.66	4.42	2.17	4.54	3.31	1.8	2.19	36.36

AUGUSTA, ILLINOIS.

Latitude, 40° 12′ N.; longitude, 89° 45′ W. from Greenwich; elevation above tide-water, 200 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, May 18; earliest frost in autumn, October 9; period without frost, 143 days. Observer, S. B. MEAD, M. D.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	36.00	18.48	42.58	51.38	57.86	71.59	74.73	72.23	65.02	53.84	34 29	30.53	50.71
Therm'r, extremes	60	48	75	81	83	88	91	91	86	85	52	52	....
	11	−23	1	27	40	52	61	50	44	31	11	1	....
Rain, inches........	2.05	1.52	3.18	7.22	9.51	5.86	7.93	2.33	2.46	3.01	3.11	2.88	51.06

AUSTIN, TEXAS.

Latitude, 30° 20′ N.; longitude, 97° 46′ W. from Greenwich; elevation above tide-water, 650 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, March 2; earliest frost in autumn, November 5; period without frost, 247 days. Observer, J. VAN NOSTRAND.

	Jan.	Feb.	Mar.	Apr.	May	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean	53.22	50.61	61.6	69.20	74.68	79.14	84.87	84.77	77.42	71.81	51.79	51.28	67.53
Therm'r, extremes	72	82	79	91	91	91	96	98	97	90	75	71	....
	33	26	27	48	55	64	72	70	60	51	27	22	....
Rain, inches........	2.95	0.96	7.02	0.49	8.8	1.07	3.8	0.44	5.01	2.9	0.75	2.18	36.37

BARDSTOWN, KENTUCKY.

Latitude, 37° 52′ N.; longitude, 85° 18′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 27; earliest frost in autumn, October 8; period without frost, 163 days. Observer, JOHN H. LUNEMAN.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	41. 56	28.82	44.57	56.4	65.69	76.02	79.22	75.25	67.62	58 96	38.72	41.9	56.23
Therm'r, extremes	61	57	78	83	89	95	94	93	89	85	58	62	....
	23	−10	25	34	46	54	64	53	46	32	16	10	....
Rain, inches........	3.04	3.22	1.27	4.7	7.25	4.87	7.53	2.73	2.69	3.39	3.29	9.36	53.34

BATAVIA, ILLINOIS.

Latitude, 41° 52′ N.; longitude, 88° 20′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 26; earliest frost in autumn, October 5; period without frost, 161 days. Observer, THOMPSON MEAD.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	32.21	15.34	35.96	45.83	54.13	69.69	73.51	70.29	63.4	49.8	31.47	24.7	47.19
Therm'r, extremes	61	41	72	82	83	101	97	102	92	81	52	45	....
	8	−23	−2	26	31	44	53	47	41	29	6	−16	....
Rain, inches........	2.02	1.86	2.01	5.35	6.07	5.78	10.49	2.35	5.38	3.73	4.36	2.41	52.72

BATTLE CREEK, MICHIGAN.

Latitude, 42° 20′ N.; longitude, 85° 10′ W. from Greenwich; elevation above tide-water, 750 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, May 22; earliest frost in autumn, November 11; period without frost, 172 days. Observer, W M. Campbell, M. D.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	34.03	20.99	36.98	47.51	55.15	72.63	74.11	70.83	64.19	51.19	35 75	31.94	49.61
Therm'r, extremes	57	51	76	78	76	96	96	97	86	76	56	49	....
	10	−15	−7	30	39	48	57	50	42	37	11	9	....
Rain, inches........	1.03	2.58	2.69	4.5	8.13	3.85	0.25	2.45	2.95	2.8	3.35	1.16	35.75

BAY CITY, WISCONSIN.

Latitude, 46° 35′ N.; longitude, 91° W. from Greenwich; elevation above tide-water, 658 feet; hours of observation, 7 A M and 2 and 9 P M. Latest frost in spring, May 14; earliest frost in autumn, October 15; period without frost, 153 days. Observer, Edwin Ellis, M. D.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	21.78	9.37	27.62	35.37	45.83	60.88	63.58	63.24	54.59	43.38	27 12	14.65	38.95
Therm'r, extremes	48	54	64	48	78	96	99	91	82	70	42	36	....
	−8	−24	−6	20	30	42	50	44	38	28	6	−24	....
Rain, inches	?	?	1.9	?	2.8	3.4	6.7	5.95	4.2	4.1	2.1	3.3	?

BEL AIR, FLORIDA.

Latitude, 30° 24′ N.; longitude, 84° 20′ W. from Greenwich; elevation above tide-water, 70 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 28; earliest frost in autumn, November 10; period without frost, 195 days. Observer, Benjamin F. Whitner.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct	Nov.	Dec.	Annual.
Thermometer, mean.	58.88	56.26	62.84	69.03	77.94	80.24	83.78	81.39	74.39	73.11	54.36	61.07	69.44
Therm'r, extremes	80	79	84	87	94	96	96	96	90	88	74	82	....
	37	35	30	48	59	59	74	60	56	55	30	38	....

BELLEFONTAINE, OHIO.

Latitude, 40° 21′ N; longitude, 83° 40′ W. from Greenwich; elevation above tide-water, 1,031 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 27; earliest frost in autumn, November 13; period without frost, 199 days. Observer, Joseph Shaw.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	37.4	25.36	40.32	50.92	58.64	74.0	74.5	69.91	65.13	55 44	38.45	34.98	51.22
Therm'r, extremes	57	54	74	77	83	95	91	91	88	83	56	53	....
	19	− 8	1	30	41	50	58	51	44	33	19	2	....
Rain, inches........	2.5	3.0	0.9	10.4	8.3	6.3	3.7	2.7	1.42	6.34	3.51	5.12	54.19

BELLEVUE, IOWA.

Latitude, 42° 15′ N.; longitude, 90° 25′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, May 18; earliest frost in autumn, October 7; period without frost, 141 days. Observer, JOHN C. FORY.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	31.03	17.07	38.85	45.88	55.92	71.75	73.46	71.54	63.41	50.56	31.85	22.27	47.8
Therm'r, extremes	54	46	71	81	80	94	92	96	90	84	51	42	....
	8	—12	2	26	40	50	61	48	40	27	4	—18	....
Rain, inches........	2.71	1.05	1.84	5.21	9.59	6.66	6.61	2.54	4.08	3.96	4.83	2.43	51.51

BELLEVUE, NEBRASKA TERRITORY.

Latitude, 41° 8′ N.; longitude, 95° 50′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, May 20; earliest frost in autumn, October 7; period without frost, 139 days. Observer, WILLIAM HAMILTON.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	32.68	17.29	44.66	48.23	55.5	70.79	74.25	71.71	64.69	52.64	31.65	25.68	49.14
Therm'r, extremes	53	60	75	83	86	90	88	90	86	85	50	50	....
	8	—18	7	27	35	50	62	50	48	28	6	—11	....
Rain, inches........	?	?	1.56	4.35	5.56	7.27	15.85	1.36	2.74	6.03	0.59	0.72	?

BELLPORT, NEW YORK.

Latitude, 40° 44′ N.; longitude, 72° 54′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 8; earliest frost in autumn, November 12; period without frost, 217 days. Observer, HENRY W. TITUS.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	34.97	25.76	33.66	46.58	53.02	66.84	71.22	68.31	62.81	54.47	39.39	34.82	49.32
Therm'r, extremes	50	45	62	65	68	87	80	82	77	74	62	50	....
	14	8	6	32	43	52	60	53	44	34	19	14	....

BELOIT, WISCONSIN.

Latitude, 42° 30′ N.; longitude, 89° 4′ W. from Greenwich; elevation above tide-water, 750 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 25; earliest frost in autumn, October 8; period without frost, 165 days. Observer, Prof. WILLIAM PORTER.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	32.2	16.76	37.59	45.77	55.23	70.05	72.95	70.28	62.64	51.26	32.66	25.69	47.76
Therm'r, extremes	56	42	68	84	84	92	91	94	89	80	50	43	....
	7	—16	4	27	40	50	60	47	40	32	— 1	—15	....
Rain, inches........	?	1.0	1.86	3.29	10.29	6.29	8.78	2.61	3.93	1.72	3.14	1.85	?

BORDER PLAINS, IOWA.

Latitude, 42° 36′ N.; longitude 94° 5′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, May 20; earliest frost in autumn, September 12; period without frost, 114 days. Observer, WILLIAM K. GOSS.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	29.19	15.71	40.98	47.01	54.32	72.66	74.39	73 96	64.43	50.83	30.12	21.08	47.85
Therm'r, extremes	52	46	75	83	84	92	92	98	90	87	47	47	....
	—8	—14	10	20	38	55	61	51	50	31	0	—22	....
Rain, inches........	?	?	?	?	4.19	9.13	13.69	4.88	1.79	6.13	1.12	0.88	?

BRANDON, VERMONT.

Latitude, 43° 45′ N.; longitude, 73° W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, May 3; earliest frost in autumn, September 23; period without frost, 142 days. Observer, DANIEL BUCKLAND.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	24.27	15.51	26.85	41.99	51.61	67.59	69.37	65.68	59.52	47.42	30.37	21.02	43.44
Therm'r, extremes	47	49	58	62	76	91	90	87	87	72	49	42	....
	—10	—13	—8	21	32	50	51	46	30	23	12	—11	....
Rain, inches........	1.83	0.61	1.48	2.26	3.56	3.88	4.8	2.96	2.97	3.59	2.64	2.38	32.96

BRIGHTON, ILLINOIS.

Latitude, 39° N.; longitude, 90° 13′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 25; earliest frost in autumn, October 9; period without frost, 166 days. Observer, WILLIAM V. ELDREDGE.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	36.68	23.05	41.06	53.64	66.28	73.27	78.96	76.43	66.31	60.65	41.13	36.94	54.62
Therm'r, extremes	65	44	70	81	88	93	94	96	86	84	79	61	....
	19	0	24	30	42	48	59	48	40	28	13	10	....
Rain, inches........	1.8	1.8	1.9	2.1	3.2	3.26	5.35	0.36	1.81	3.8	3.52	2.37	31.27

BUFFALO, NEW YORK

Latitude, 42° 50′ N.; longitude, 78° 56′ W. from Greenwich; elevation above tide-water, 680 feet; hours of observation, 8 A.M. and 2 and 9 P.M. Earliest frost in autumn, September 23. Observer, WILLIAM IVES.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean	34.66	21.96	31.8	43.65	52.67	67.42	71.47	70.7	63.5	53.61	37.61	33.47	48.54
Therm'r, extremes	55	40	58	70	68	83	85	82	79	71	65	51	....
	20	4	7	30	40	52	58	56	48	39	24	16	....
Rain, inches........	?	2.44	1.69	2.17	4.4	4.71	4.66	2.38	4.32	4.68	5.11	3.87	?

BURLINGTON, VERMONT.

Latitude, 44° 29′ N.; longitude, 73° 11′ W. from Greenwich; elevation above tide-water, 346 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 27; earliest frost in autumn, October 25; period without frost, 180 days. Observer, M. K. Petty

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	23.23	12.9	26.14	41.8	51.92	67.41	66.24	64.83	58.7	48.12	30.36	20.02	42.64
Therm'r, extremes {	48	44	53	60	75	88	84	78	82	69	47	42	....
	— 2	—14	—13	20	36	51	54	48	35	24	11	—11	....
Rain, inches........	1.64	?	?	1.82	2.68	2.27	4.65	2.12	2.51	2.62	2.4	?	?

CAMBRIDGE, MASSACHUSETTS.

Latitude, 42° 22′ N.; longitude, 71° 07′ W. from Greenwich; elevation above tide-water, 71 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, May 30; earliest frost in autumn, October 10; period without frost, 144 days. Observer, Prof. W. C. Bond.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	31.44	22.49	31.78	45.33	52.63	67.62	69.71	66.24	61.85	53.07	35.42	28.53	47.18
Therm'r, extremes {	57	47	65	67	71	89	91	85	84	75	62	57	....
	4	1	0	27	38	48	56	50	39	30	16	9	....
Rain, inches........	3.44	1.86	1.77	3.81	3.71	7.55	4.36	5.57	4.94	2.87	2.37	3.04	45.26

CHAPEL HILL, NORTH CAROLINA.

Latitude, 35° 54′ N.; longitude, 79° 17′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 27; earliest frost in autumn, November 16; period without frost, 202 days. Observer, Prof. James Phillips.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	44.46	36.79	46.61	58.83	68.01	76.81	79.05	78.58	67.77	62.03	45.93	46.69	59.3
Therm'r, extremes {	64	60	76	89	90	97	97	98	93	89	68	73	....
	28	22	18	34	52	58	66	64	46	45	26	21	....
Rain, inches........	2.6	5.28	2.82	2.76	2.41	3.75	6.15	2.72	4.12	1.95	3.39	6.01	43.96

CHARLESTON, SOUTH CAROLINA.

Latitude, 32° 46′ N.; longitude, 80° W. from Greenwich; elevation above tide-water, 30 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, March 4. Observers, Joseph Johnson and J. L. Dawson, M. D. D.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	55.78	49.19	55.87	65.49	72.97	79.3	81.2	81.39	73.67	70.03	53.14	57.77	66.32
Therm'r, extremes {	67	65	79	79	84	88	94	93	87	82	76	71	....
	41	35	29	42	62	69	70	72	57	57	35	35	....
Rain, inches........	?	5.66	1.8	1.14	4.13	2.05	[illegible]	6.79	8.28	0.93	4.09	2.51	?

CINCINNATI, OHIO.

Latitude, 39° 6′ N.; longitude 84° 27′ W. from Greenwich; elevation above tide-water, 150 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, March 13; earliest frost in autumn, November 15; period without frost, 246 days. Observer, G. W. HARPER.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	42.2	30.48	44.98	56.98	64.29	76.04	81.56	79.99	71.45	61.93	42.47	45.08	58.13
Therm'r, extremes	61	63	78	87	87	94	93	89	89	86	62	69	....
	28	1	12	35	44	56	70	60	52	41	24	17	....
Rain, inches........	2.56	1.76	1.05	4.34	8.32	5.69	3.01	7.97	0.85	4.66	2.57	6.41	49.19

CLEVELAND, OHIO.

Latitude, 41° 30′ N.; longitude, 81° 40′ W. from Greenwich; elevation above tide-water, 665 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 26; earliest frost in autumn, November 14; period without frost, 201 days. Observer, GUSTAVUS A. HYDE.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	35.56	22.69	34.37	47.17	56.42	72.32	73.73	69.88	63.78	54.44	36.73	35.04	50.18
Therm'r, extremes	61	51	68	68	78	91	92	90	87	82	57	58	....
	18	—85	4	27	42	51	61	53	42	37	18	13	....
Rain, inches........	1.23	1.96	1.31	4.07	7.54	3.9	5.79	5.08	3.37	1.53	5.06	3.32	44.16

CLINTON, NEW YORK.

Latitude, 43° N.; longitude, 75° 20′ W. from Greenwich; elevation above tide-water, 500 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, May 22; earliest frost in autumn, September 14; period without frost, 114 days. Observer, H. M. PAINE, M. D.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	30.72	19.16	31.27	46.5	54.28	71.07	72.73	69.67	62.79	51.8	34.5	26.5	47.58
Therm'r, extremes	55	47	64	70	80	92	96	92	94	80	56	43	....
	—3	—12	—6	23	41	51	53	48	33	27	17	2	....
Rain, inches........	2.43	2.07	1.41	4.37	4.73	4.2	4.18	3.34	3.31	4.25	3.9	3.63	41.82

COLUMBIA, CONNECTICUT.

Latitude, 41° 42′ N.; longitude, 72° 16′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 27; earliest frost in autumn, September 22; period without frost, 147 days. Observer, WILLIAM H. YEOMANS.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	31.33	22.64	31.92	45.83	53.27	67.69	69.06	66.3	61.8	53.17	35.07	29.87	47.33
Therm'r, extremes	52	49	63	[illegible]	74	92	88	86	86	84	68	58	....
	0	—1	—6	28	40	47	52	50	38	32	8	8	....

COOPER, MICHIGAN.

Latitude, 42° 40′ N.; longitude, 85° 31′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, May 19; earliest frost in autumn, October 8; period without frost, 141 days. Observer, Mrs. OCTAVIA C. WALKER.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	34.28	22.09	37.88	45.05	49.97	74.26	80.73	69.39	61.79	53.0	35.37	32.66	49.71
Therm'r, extremes {	56	44	64	72	78	98	98	94	74	70	48	44	....
	16	—4	8	24	30	50	56	50	50	38	24	8	....

CORNISH, MAINE.

Latitude, 43° 40′ N.; longitude, 70° 44′ W. from Greenwich; elevation above tide-water, 800 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, May 30; earliest frost in autumn, September 23; period without frost, 115 days. Observer, G. W. GUPTILL.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	23 8	15.4	27.74	39.95	50.93	66.95	67.72	66.23	58.78	47.96	30.65	21.86	43.16
Therm'r, extremes {	46	48	51	64	72	88	88	80	84	71	58	42	....
	—2	—7	1	23	38	46	52	51	37	30	16	—2	....
Rain, inches........	4.25	2.1	1.82	3.97	3.25	2.6	8.23	3.44	5.15	2.15	2.7	2.45	42.11

CRAFTSBURY, VERMONT

Latitude, 44° 40′ N.; longitude, 72° 30′ W. from Greenwich; elevation above tide-water, 1,100 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 28; earliest frost in autumn, September 23; period without frost, 147 days. Observer, JAMES A. PADDOCK.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	19.23	10.86	23.55	38.18	49.8	64.77	64.56	63.52	56.5	44.58	26.93	16.39	39.91
Therm'r, extremes {	46	47	55	56	73	89	83	81	82	73	47	40	....
	—9	—18	—6	17	33	48	50	44	33	23	8	—15	....
Rain, inches........	1.9	1.4	2.0	2.67	3.45	4.12	3.95	4.85	4.4	4.21	3.1	2.35	38.4

CRICHTON'S STORE, VIRGINIA.

Latitude, 36° 40′ N.; longitude, 77° 46′ W. from Greenwich; elevation above tide-water, 500 feet; hours of observation, irregular. Latest frost in spring, April 28; earliest frost in autumn, October 9; period without frost, 163 days. Observer, Lieut. B. F. ASTROP.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	48.34	38.76	50.25	62.08	68.59	78.92	81.79	81.62	72.14	65.12	48.38	45.93	61.83
Therm'r, extremes {	67	54	77	86	90	96	97	100	89	88	71	70	....
	30	22	17	39	49	60	67	64	50	47	30	22	....
Rain, inches........	2.0	3.16	1.42	4.71	3.91	3.4	2.26	3.35	0.61	0.26	1.03	6.05	32.16

DUBUQUE, IOWA.

Latitude, 42° 30′ N.; longitude, 90° 52′ W. from Greenwich; elevation above tide-water, 1,258 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, May 18; earliest frost in autumn, October 7; period without frost, 141 days. Observer, Asa Horr, M. D.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean	31.07	16.86	39.12	46.81	56.23	72.92	73.48	72.28	64.42	51.13	32.9	23.37	48 38
Therm'r, extremes	51	49	70	80	80	93	90	96	88	82	49	43	....
	8	—14	4	27	41	55	61	49	44	33	5	—11	....
Rain, inches........	1.91	0.78	1.84	4.37	8.23	4.86	8.69	1.37	5.55	5.63	3.01	0.95	47.19

ELGIN, ILLINOIS.

Latitude, 42° N.; longitude, 88° 15′ W. from Greenwich; elevation above tide-water, 600 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, May 18; earliest frost in autumn, October 8; period without frost, 142 days. Observer, J. B. Newcomb.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean	31.57	13.65	36.43	45.61	55.19	69.69	71.41	69.31	62.52	50.55	32.8	25.54	47.19
Therm'r, extremes	58	40	71	78	79	90	90	93	87	79	53	44	....
	8	—26	0	22	38	44	57	48	45	32	7	—16	....
Rain, inches........	?	1.8	3.08	3.95	8.0	4.08	6.42	3.31	4.2	2.94	4.29	1.73	?

FAIRFIELD, IOWA.

Latitude, 41° 1′ N.; longitude, 91° 57′ W. from Greenwich; elevation above tide-water, 940 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 25; earliest frost in autumn, October 8; period without frost, 165 days. Observer, J. M. Shaffer.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean	34.79	17.66	41.84	49.73	56.63	72.72	75.88	73.34	65.18	52.61	32.12	26.35	49.9
Therm'r, extremes	59	52	76	80	83	90	92	94	87	88	47	49	....
	8	—15	1	30	41	56	60	53	50	32	5	— 8	....
Rain, inches........	?	?	?	6.84	8.47	5.59	9.44	?	4.65	6.2	?	?	?

FISHKILL, NEW YORK.

Latitude, 41° 34′ N.; longitude, 74° 18′ W. from Greenwich; elevation above tide-water, 42 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, May 29; earliest frost in autumn, September 23; period without frost, 116 days. Observer, William H. Denning.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean	33.73	24.17	35.21	48.83	55.74	72.67	73.85	69.06	63.11	54.51	36.94	29.04	49.74
Therm'r, extremes	54	45	61	75	75	94	93	84	84	76	63	48	....
	9	— 4	5	31	40	41	59	48	38	32	19	8	....
Rain, inches........	1.86	0.8	0.9	2.4	4.1	3.8	3.0	3.6	1.4	2.3	4.3	1.6	30.06

FLATBUSH, NEW YORK.

Latitude, 40° 37′ N.; longitude, 74° 31′ W. from Greenwich; elevation above tide-water, 54 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 26; earliest frost in autumn, September 26; period without frost, 152 days. Observer, Rev. R. D. VAN KLEEK.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	35.83	26.23	35.96	47.51	53.76	70.62	72.58	69.6	63.03	55.45	38.79	33.15	50.21
Therm'r, extremes	53	43	63	77	77	93	91	86	82	84	63	54	....
	17	10	7	32	44	51	60	54	42	34	21	14	....
Rain, inches........	2.77	2.24	1.6	4.86	4.95	5.34	5.06	2.77	2.9	1.92	4.49	4.33	43.23

FLEMING, PENNSYLVANIA.

Latitude, 40° 55′ N.; longitude, 77° 53′ W. from Greenwich; elevation above tide-water, 780 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, May 23: earliest frost in autumn, August 24; period without frost, 92 days. Observer, SAMUEL BRUGGER.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	33.89	24.23	35.27	47.91	56.54	72.30	74.83	69.39	60.79	52.12	37.63	32.55	49.70
Therm'r, extremes	53	51	70	70	78	95	92	89	85	82	58	54	....
	10	— 6	2	29	44	53	56	44	40	22	19	10	....

FORT EDWARD, NEW YORK.

Latitude, 43° 13′ N.; longitude, 73° 42′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 27; earliest frost in autumn, October 3; period without frost, 158 days. Observer, Prof. SOLOMON SIAS.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer mean.	23.62	16.24	29.78	45.04	53.69	69.96	70.74	67.57	60.85	49.82	32.51	21.2	45.09
Therm'r, extremes	42	45	57	65	76	90	90	84	86	70	52	51	....
	—11	—18	— 5	24	35	50	57	50	36	30	13	—12	....
Rain, inches........	3.14	1.9	0.87	4.22	8.7	7.85	4.92	4.71	4.27	8.57	8.3	4.3	61.75

FORT MADISON, IOWA.

Latitude, 40° 37′ N.; longitude, 91° 28′ W. from Greenwich; hours of observation, 6 A.M., 12 M., and 7 P.M. Latest frost in spring, April 24; earliest frost in autumn, October 9; period without frost, 167 days. Observer, D. McCREADY.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	34.54	18.4	41.88	50.01	57.92	74.17	76.2	78.96	65.29	52.7	33.9	28.39	50.61
Therm'r, extremes	57	46	74	80	82	95	94	95	90	82	48	51	....
	11	—16	1	24	39	54	64	46	42	29	6	— 6	....
Rain, inches........	1.72	2.28	1.84	6.85	8.1	6.36	5.9	1.59	3.11	5.93	4.64	2.78	51.1

FREDERICK CITY, MARYLAND.

Latitude, 39° 24′ N.; longitude, 77° 18′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 26; earliest frost in autumn, October 16; period without frost, 172 days. Observer, HENRY E. HANSHAW.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Thermometer, mean.	39 22	28.66	40.32	51.24	59.6	75.13	77.05	72.8	63.83	55.55	40.03	38.61	53.34
Therm'r, extremes	60	47	70	77	79	93	92	88	84	83	61	56	....
	25	5	8.5	34	48	59	65	53	43	32	24	19	....
Rain, inches........	1.87	1.66	1.01	3.41	7.35	5.76	4.44	4.89	5.26	4.1	3.38	4.14	47.27

GAINESVILLE, FLORIDA.

Latitude, 29° 30′ N.; longitude, 82° 26′ W. from Greenwich: elevation above tide-water, 184 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, March 4. Observer, J. B. BAILEY.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	59.32	57.48	60.29	66.98	74.7	77.7	78.72	78.86	74.39	72.59	56.39	61.99	68.28
Therm'r, extremes	79	76	83	91	95	90	98	92	87	85.	75	80	....
	36	34	30	40	56	65	70	68	59	59	37	43	....
Rain, inches........	?	4.67	?	?	2.77	?	9.7	2.43	11.69	?	?	?	?

GARDINER, MAINE.

Latitude, 44° 11′ N.; longitude, 69° 46′ W. from Greenwich; elevation above tide-water, 90 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 27; earliest frost in autumn, September 10; period without frost, 105 days. Observer, R. H. GARDINER.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	21.8	15.35	27.85	40.75	51.79	64.54	69.89	67.36	59.4	47.92	30.48	16.81	42.63
Therm'r, extremes	45	46	55	64	70	88	88	77	85	71	60	39	....
	—24	—12	—10	26	38	42	43	42	34	23	3	—13	....
Rain, inches........	3.31	2.33	3.16	4.44	3.02	2.52	6.43	7.25	3.74	5.06	2.91	2.87	47.04

GASTON, NORTH CAROLINA.

Latitude, 36° 32′ N.; longitude, 77° 45′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, May 22; earliest frost in autumn, September 28; period without frost, 128 days. Observer, GEORGE F. MOORE, M. D.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	43.59	35.12	45.61	56.98	65.57	76.67	79.05	77.09	66.8	61.3	44 08	44.18	58.0
Therm'r, extremes	64	64	77	89	90	98	100	100	92	88	73	72	....
	22	19	13	32	42	58	66	58	44	41	23	16	....
Rain, inches........	2.17	4.08	2.44	5.43	4.03	2.24	4.05	3.62	2.32	1.38	2.73	6.14	40.83

GETTYSBURG, PENNSYLVANIA.

Latitude, 39° 51′ N.; longitude, 77° 15′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 7; earliest frost in autumn, October 26; period without frost, 201 days. Observer, Prof. M. JACOBS.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	35.58	25.23	38.31	50.32	59.0	74.41	76.01	72.38	63.44	58.17	37.58	34.18	52.05
Therm'r, extremes {	59	51	79	80	79	95	95	90	86	86	63	60	……..
	18	−8	0	28	43	56	58	48	40	34	17	11	……..
Rain, inches……..	1.64	1.91	0.61	2.87	10.6	4.39	3.91	4.27	2.67	4.57	3.34	4.87	45.65

GLENWOOD COTTAGE, TENNESSEE.

Latitude, 36° 28′ N.; longitude, 87° 13′ W. from Greenwich; elevation above tide-water, 481 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 27; earliest frost in autumn, October 8; period without frost, 163 days. Observer, Prof. WILLIAM M. STUART

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	44.08	34.12	48.74	57.78	65.59	72.34	76.01	73.85	67.55	60.63	40.03	44.74	57.12
Therm'r, extremes {	62	68	79	79	85	89	89	90	86	86	63	70	……..
	28	8	17	34	45	53	64	54	48	37	21	17	……..
Rain, inches……..	4.21	3.18	4.0	6.57	4.59	6.55	4.13	1.69	2.11	2.59	2.6	11.48	53.7

GOLIAD, TEXAS.

Latitude, 28° 30′ N.; longitude, 97° 15′ W. from Greenwich; elevation above tide-water, 50 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, March 2; earliest frost in autumn, November 4; period without frost, 246 days. Observer, JOHN C. BRIGHTMAN.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	57.05	54.58	64.47	69 68	75.5	78.98	83.08	83.44	78.23	68.14	58.4	56.91	69.04
Therm'r, extremes {	72	78	78	85	86	90	95	96	93	92	78	75	……..
	40	30	31	53	57	67	75	72	62	57	34	31	……..
Rain, inches……..	?	0.53	1.41	?	6.55	1.97	1.41	0.43	1.33	4.23	?	2.86	?

GRAND RAPIDS, MICHIGAN.

Latitude, 43° N.; longitude, 86° W. from Greenwich; elevation above tide-water, 852 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, May 22; earliest frost in autumn, August 24; period without frost, 93 days. Observer, L. H. STRENG.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	31.46	18.75	35.31	45.31	55.05	70.92	73.55	69.76	60.83	50.36	35.13	30.43	48.07
Therm'r, extremes {	56	48	67	78	78	98	93	98	89	79	51	47	……..
	2	−16	−2	24	38	47	58	44	37	32	20	8	……..
Rain, inches……..	?	1.17	3.71	2.38	6.57	4.5	0.78	2.88	4.33	3.36	2.25	1.0	?

GREENE SPRINGS, ALABAMA.

Latitude, 32° 50′ N.; longitude, 87° 46′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 28; earliest frost in autumn, October 1; period without frost, 155 days. Observer, H. TUTWILER.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	50.11	43.74	56.37	63.19	70.5	76.5	79.32	78.08	73.9	66.23	44.14	51.69	62.9
Therm'r, extremes	68	71	77	83	90	95	93	95	94	89	71	78	....
	31	22	24	37	49	59	69	55	53	39	24	24	... .
Rain. inches........	8.69	6.48	3.59	3.22	2.77	3.6	4.41	3.88	?	4.29	2.16	7.5	?

HAMILTON, CANADA.

Latitude, 43° 15′ N.; longitude, 79° 57′ W. from Greenwich; hours of observation, 9 A.M. and 9 P.M. Latest frost in spring, March 23; earliest frost in autumn, November 11; period without frost, 232 days. Observer, W. CRAIGIE, M. D.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	32.22	19.98	32.15	44.58	51.18	70.84	71.61	71.42	63.19	52.82	36.75	30.92	48.14
Therm'r, extremes	48	42	55	66	68	88	85	84	80	75	52	50	....
	16	−4	4	31	40	51	60	58	48	42	25	14	....

HARRISBURG, PENNSYLVANIA.

Latitude, 40° 16′ N.; longitude, 76° 50′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, March 12; earliest frost in autumn, November 14; period without frost, 246 days. Observer, JOHN HEISELY, M. D.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	39.4	29.07	41.56	52.52	60 69	78.0	80.65	75.54	67.9	59.07	41.92	35.98	55.19
Therm'r, extremes	58	47	66	77	79	96	95	91	90	86	62	54	....
	22	4	11	35	50	57	64	56	48	37	29	21	....
Rain, inches........	1.75	?	?	3.56	5.51	3.27	2.05	4.07	2.05	4.16	2.84	?	?

HARTWOOD, VIRGINIA.

Latitude, 38° 15′ N.; longitude, 77° 34′ W. from Greenwich; elevation above tide-water, 350 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 26; earliest frost in autumn, October 11; period without frost, 167 days. Observer, ABRAM VAN DOREN.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Thermometer, mean.	42.53	36.06	43.63	53.19	61.42	75.18	74.87	77.34	68.48	60.68	43.95	41.9	56.44
Therm'r, extremes	64	60	78	84	86	98	97	98	92	91	68	66	....
	26	10	10	34	45	56	60	62	48	40	20	16	....
Rain, inches........	?	?	1.38	?	?	?	?	?	1.29	2.32	5.05	5.47	?

HAZLEWOOD, MINNESOTA.

Latitude, 45° N.; longitude, 95° 30′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 24; earliest frost in autumn, October 7; period without frost, 165 days. Observer, S. R. Riggs.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	21.45	11.33	37.15	40.29	53.1	67.44	71.22	68.85	57.99	46.68	26.47	14.74	43.06
Therm'r, extremes	45	50	63	74	78	92	88	90	77	74	43	38	....
	—12	—18	2	16	37	44	57	35	34	24	— 5	—16	....
Rain, inches........	1.64	?	?	4.43	3.59	2.97	5.61	5.27	4.07	1.41	1.53	0.28	?

HILLSBOROUGH, OHIO.

Latitude, 39° 13′ N.; longitude, 83° 30′ W. from Greenwich; elevation above tide-water, 1,000 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 27; earliest frost in autumn, September 23; period without frost, 148 days. Observer, J. McD. Matthews.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	38.12	25.39	39.4	52.24	59.11	72.39	74.91	71.51	64.42	54.96	35.44	38.27	52.18
Therm'r, extremes	58	49	67	77	80	92	90	88	82	80	57	62	....
	23	2	4	34	40	51	60	53	46	35	17	9.5	....
Rain, inches........	1.8	2.5	1.24	4.24	9.57	5.34	4.01	4.59	1.72	2.85	3.06	6.37	47.29

HIRAM, OHIO.

Latitude, 41° 20′ N.; longitude, 81° 15′ W. from Greenwich; elevation above tide-water, 80 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 25; earliest frost in autumn, September 26; period without frost, 153 days. Observer, S. M. Luther.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	34.57	23.04	35.15	47.93	56.03	70.42	72.64	68.65	63.09	54.36	34.62	34.29	49.57
Therm'r, extremes	59	49	75	75	75	90	89	85	86	80	59	53	....
	16	— 5	— 2	26	38	50	59	50	47	32	20	12	....
Rain, inches........	1.38	1.48	1.52	4.71	3.91	3.23	4.69	3.57	1.23	2.78	2.96	3.26	34.72

KENOSHA, WISCONSIN.

Latitude, 42° 35′ N.; longitude, 87° 50′ W. from Greenwich; elevation above tide-water, 600 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 25; earliest frost in autumn, October 8; period without frost, 165 days. Observer, John Gridley.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	33.12	18.54	36.24	43.46	50.87	67.32	70.7	69.58	61.32	51.3	35.48	30.11	47.34
Therm'r, extremes	52	39	71	80	72	85	85	88	88	78	52	42	....
	12	—14	6	30	37	48	57	48	47	33	9.5	— 6	....
Rain, inches........	?	?	1.27	3.42	6.2	7.13	?	?	?	?	4.44	0.99	?

LAWRENCE, KANSAS TERRITORY.

Latitude, 38° 58′ N.; longitude, 95° 12′ W. from Greenwich; elevation above tide-water, 800 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, March 9; earliest frost in autumn, October 7; period without frost, 211 days. Observer, G. W. BROWN.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	38.61	26.56	49.42	54.92	61.99	74.57	80.78	75.85	69.41	55.2	34.73	31.98	54.5
Therm'r, extremes {	60	64	74	80	86	94	96	98	94	82	54	54	....
	17	—2	14	36	44	55	69	55	53	36	14	—3	....

MADISON, INDIANA.

Latitude, 38° 46′ N.; longitude, 85° 17′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, March 13; earliest frost in autumn, November 13; period without frost, 244 days. Observer, C. BARNES.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	38.38	26.58	40.81	53.51	60.61	72.17	77.38	74.17	64.12	54.74	37.25	39.34	53.26
Therm'r, extremes {	56	50	67	78	78	90	90	89	84	84	54	58	....
	25	2	8	36	44	56	64	54	44	33	21	13	....
Rain, inches........	2.72	2.08	1.56	5.33	9.68	6.31	1.98	2.23	2.82	1.09	2.16	8.62	46.58

MADISON, OHIO.

Latitude, 41° 49′ N.; longitude, 81° 10′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 28; earliest frost in autumn, September 26; period without frost, 150 days. Observer, Rev. L. S. ATKINS.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	35.07	21.53	33.77	48.63	56.39	73.34	71.97	69.27	66.62	52.5	36.82	35.73	51.8
Therm'r, extremes {	62	52	70	79	85	94	88	88	87	80	54	57	....
	18	—6	1	24	41	48	54	50	48	26	20	10	....

MANCHESTER, ILLINOIS.

Latitude, 39° 33′ N.; longitude, 90° 34′ W. from Greenwich; elevation above tide-water, 683 feet; hours of observation, 7 A.M. and 1 and 9 P.M. Latest frost in spring, April 6; earliest frost in autumn, October 9; period without frost, 185 days. Observer, JOHN GRANT.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	36.16	22.08	43.71	51.78	58.92	71.89	78.68	73.11	66.48	57.29	34.61	32.79	52.29
Therm'r, extremes {	59	49	76	82	84	92	92	94	88	87	54	54	....
	14	11	5	30	43	52	60	50	48	30	10	3	....
Rain, inches........	2.35	1.67	2.05	3.65	9.2	7.6	6.53	2.19	4.6	4.29	2.86	2.46	49.45

MANITOWOC, WISCONSIN.

Latitude 44° 7′ N.; longitude 87° 37′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 25; earliest frost in autumn, September 11; period without frost, 138 days. Observer, JACOB LUPS.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	32.12	20.17	35.26	42.19	50.41	65.84	69.62	68.01	59.04	48.48	35.42	28.51	46.26
Therm'r, extremes {	48	48	70	72	71	87	84	91	87	74	52	44	....
	5	—11	2	28	38	47	54	49	40	32	14	—11	....

MARENGO, ILLINOIS.

Latitude 42° 14′ N.; longitude 88° 38′ W. from Greenwich; elevation above tide-water, 650 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, May 16; earliest frost in autumn, October 8; period without frost, 144 days. Observer, O. R. ROGERS.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	33.09	18 34	38.71	45.68	55.64	72.93	74.0	72.1	64.31	51.77	33.06	26.91	48.82
Therm'r, extremes. {	54	46	72	82	82	96	96	100	86	80	54	46	....
	10	—14	2	26	36	46	58	46	44	32	4	—16	.. ....
Rain, inches........	1.15	?	2.99	?	7.64	8.0	3.71	6.27	4.45	3.43	4.17	1.54	?

MEADOW DALE, VIRGINIA.

Latitude 38° 23′ N.; longitude 79° 35′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 27; earliest frost in autumn, August 20; period without frost, 114 days. Observer, JAMES SLAVEN.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	36.51	27.9	36.21	47.37	56.25	66.91	68.60	66.22	59.52	53.4	34.34	37.56	49.25
Therm'r, extremes. {	58	53	69	72	76	86	83	83	82	77	58	60	....
	15	1	— 1	24	38	40	54	41	30	30	10	8	....
Rain, inches........	1.53	1.66	3.01	5.9	2.8	5.17	3.78	2.2	1.4	4.72	4.5	4.2	40.87

MEMPHIS, TENNESSEE.

Latitude 35° 8′ N.; longitude 90° W. from Greenwich; elevation above tide-water, 262 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, March 8; earliest frost in autumn, November 16; period without frost, 252 days. Observer, W. J. TUCK, M. D.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	47.46	39.38	53.88	62.36	69.21	77.93	82.08	78.7	71.88	63.78	43.19	47.4	61.44
Therm'r, extremes. {	62	68	78	82	88	92	94	95	90	85	63	69	....
	33	16	24	44	51	62	72	59	58	42	25	22	... .
Rain, inches........	4.91	3.25	4.75	3.15	7.56	5.0	9.64	3.37	1.4	1.92	3.14	5.46	53.55

MENDON, MASSACHUSETTS.

Latitude 42° 6′ N.; longitude 72° 33′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, May 26; earliest frost in autumn, October 26; period without frost, 152 days. Observer, GEO. METCALF, M. D.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	29.53	21.96	33.2	45.13	52.63	68.44	69.82	65.68	61.23	52.7	34.16	27.1	46.8
Therm'r, extremes.	48	40	56	70	70	92	92	81	86	75	60	53	....
	4	2	.....	26	40	45	57	49	35	32	10	6	....
Rain, inches........	?	?	?	2.7	4.0	6.0	2.9	4.08	5.4	2.2	1.56	5.8	?

MILWAUKIE, WISCONSIN.

Latitude 43° 4′ N.; longitude 87° 59′ W. from Greenwich; elevation above tide-water, 593 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 25; earliest frost in autumn, October 8; period without frost, 165 days. Observer, C. WINKLER, M. D.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Thermometer, mean.	30.9	16.83	35.25	41.51	49.55	67.23	70.92	68.85	61.66	49.3	33.6	27.86	46.12
Therm'r, extremes	52	42	69	76	76	91	89	93	89	78	50	42	.. ..
	8	—14	3	28	37	46	58	45	45	32	10	—10	....
Rain, inches........	?	2.46	2.11	5.15	8.51	4.08	3.86	2.75	3.92	4.59	4.95	1.93	?

MORRISVILLE, PENNSYLVANIA.

Latitude 40° 12′ N.; longitude 74° 53′ W. from Greenwich; elevation above tide-water, 30 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, May 24; earliest frost in autumn, October 26; period without frost, 154 days. Observer, EBENEZER HANCE.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	37.03	25.83	36.74	49.81	56.67	74.43	75.15	70.77	63.96	55.87	38.02	33.83	51.51
Therm'r, extremes.	57	51	69	84	75	96	94	86	86	88	68	60	....
	18	— 2	4	34	45	54	60	54	42	32	20	12	....
Rain, inches........	3.0	2.2	1.60	3.9	5.5	5.2	3.2	3.2	1.6	1.4	4.9	4.4	40.1

MOUNT JOY, PENNSYLVANIA.

Latitude 40° 8′ N.; longitude 77° 32′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 26; earliest frost in autumn, October 26; period without frost, 182 days. Observer, J. R. HOFFER.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	39.05	27.3	40.02	52.28	60.88	77.65	81.45	74.72	67.36	58.74	41.39	35.59	54.7
Therm'r, extremes	61	51	78	81	81	101	103	96	92	89	67	57	....
	19	—7.5	—4.5	34	49	56	67	57	41	28	24	15	....
Rain, inches........	1.35	1.49	0.65	3.88	10.23	8.08	1.74	3.48	2.09	2.5	3.81	5.1	44.41

MURFREESBOROUGH, NORTH CAROLINA.

Latitude, 36° 30′ N.; longitude, 77° 6′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 27; earliest frost in autumn, October 10; period without frost, 165 days. Observer, Rev. A. McDowell.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	46.31	38.32	47.89	58.97	66.56	77.11	79.37	78.24	67.98	60.81	45.99	46.75	59.53
Therm'r, extremes.	64	62	74	86	88	96	95	98	92	84	72	73	....
	30	25	17	37	51	61	68	58	50	38	27	22	....
Rain, inches........	2.47	4.4	1.87	4.68	3.35	2.97	2.0	0.35	2.35	0.66	3.21	4.23	32.54

MURRYSVILLE, PENNSYLVANIA.

Latitude, 40° 28′ N.; longitude, 79° 35′ W. from Greenwich; elevation above tide-water, 960 feet; hours of observation. 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 26; earliest frost in autumn, September 23; period without frost, 149 days. Observer, Thomas H. Stuart.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	35.21	23.31	34.84	48.99	58.83	71.87	74.37	70.14	60.99	53.44	36.03	36.12	50.35
Therm'r, extremes	65	47	70	77	81	91	91	89	85	80	60	62	....
	14	−14	− 6	29	44	52	61	49	35	29	11	6	....
Rain, inches........	1.07	2.36	0.88	4.57	5.65	4.65	2.52	2.7	1.0	2.11	3.74	4.76	36.01

MUSCATINE, IOWA.

Latitude, 41° 26′ N.; longitude, 91° 5′ W. from Greenwich; elevation above tide-water, 586 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 26; earliest frost in autumn, October 8; period without frost, 164 days. Observer, T. S. Parvin.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	29.78	16.06	38.54	46.21	56.75	70.64	72.57	70.14	63.47	52.17	32.58	25.15	47.84
Therm'r, extremes.	52	46	70	78	81	91	89	93	87	85	52	48	....
	8	−22	2	24	32	52	52	46	42	30	4	−15	....
Rain, inches........	1.6	2.0	2.2	5.67	8.4	6.77	7.3	4.12	6.1	4.95	4.54	2.9	56.55

NANTUCKET, MASSACHUSETTS.

Latitude, 41° 16′ N.; longitude, 70° 6′ W. from Greenwich; elevation above tide-water, 30 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, March 23; earliest frost in autumn, November 12; period without frost, 233 days. Observer, Hon. William Mitchell.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	37.73	29.56	35.31	46.25	50.69	63.0	68.94	67.14	64.35	56.17	41.65	37.6	49.87
Therm'r, extremes.	54	49	52	62	63	78	80	80	78	72	58	54	....
	18	11	14	34	41	50	58	58	48	43	28	22	....
Rain, inches........	4.42	1 63	2.81	4.33	2.43	1.98	4.57	4.26	2.46	3.58	3.71	5.78	41.96

NEWARK, NEW JERSEY.

Latitude, 40° 45′ N.; longitude, 74° 10′ W. from Greenwich; elevation above tide-water, 30 feet; hours of observation, daily extremes. Latest frost in spring, April 26; earliest frost in autumn, September 23; period without frost, 149 days. Observer, W. T. Whitehead.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	36.15	26.47	36.8	48.6	54.82	70.94	73.4	69.41	62.94	55.11	38.68	32.85	50.52
Therm'r, extremes {	54	46	64	77	76	91	91	84	82	83	61	55	....
	16	—0.25	65	30	40	46	57	48	39	35	22	11	....
Rain, inches........	3.41	2.5	2.14	3.85	5.0	4.65	3.0	4.21	1.41	1.24	4.79	4.26	40.46

NEW BUFFALO, MICHIGAN.

Latitude, 41° 45 N.; longitude, 86° 46′ W. from Greenwich; elevation above tide-water, 600 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, May 21; earliest frost in autumn, October 5; period without frost, 136 days. Observer, J. B. Crosby.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	34.45	20.8	37.15	46.93	54.54	70.74	73.01	69.16	62.74	50.97	35.84	31.44	48.98
Therm'r, extremes {	58	44	68	73	74	94	92	90	88	79	53	55	....
	13	—14	3	26	35	44	54	46	42	30	18	10	....
Rain, inches........	1.91	2.78	4.0	3.69	7.76	5.62	2.4	7.3	5.51	3.25	5.75	2.45	52.42

NEW LISBON, OHIO.

Latitude, 40° 45′ N.; longitude 80° 46′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, May 22; earliest frost in autumn, September 17; period without frost, 117 days. Observer, J. F. Benner.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	40.79	28.97	40.91	55.46	63.45	78.15	81.07	75.39	65.34	58.13	41.25	40.56	55.79
Therm'r, extremes {	69	58	76	86	86	106	105	98	94	83	66	65	....
	20	—12	—2	28	40	57	64	50	36	34	8	5	....
Rain, inches........	0.55	3.3	1.08	4.12	7.44	4.76	4.12	3.84	1.3	3.01	3.48	5.45	42.45

NEW ORLEANS, LOUISIANA.

Latitude, 29° 57′ N.; longitude, 90° W., from Greenwich; elevation above tide-water, 4 feet; hours of observation, 9 A.M., 12 M., and 3 P.M. Period without frost, 365 days. Observer, L. B. Taylor.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean	62.45	58.57	68.95	74.93	83.05	85.09	87.27	87.3	82.58	77.38	57.62	63.47	74.06
Therm'r, extremes {	79	80	89	89	94	92	94	95	92	87	77	80	....
	46	34	38	56	68	74	78	75	74	65	45	44	....

NORRISTOWN, PENNSYLVANIA.

Latitude, 40° 8′ N.; longitude, 75° 19′ W. from Greenwich; elevation above tide-water, 153 feet; hours of observation, 7 A. M. and 2 and 9 P. M. Latest frost in spring, April 26; earliest frost in autumn, October 26; period without frost, 182 days. Observer, Rev. J. Grier Ralston.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	37.93	24.7	37.27	49.5	56.14	72.3	74.06	70.4	63.69	54.99	39.32	35.11	51.28
Therm'r, extremes {	59	47	66	78	78	90	91	89	85	84	56	64	....
	19	—10	6	33	46	54	61	49	41	30	25	17	....
Rain, inches........	2.85	2.78	1.17	4.11	6.62	4.61	2.87	2.04	1.32	1.8	4.7	4.46	39.33

NORTH WHITEHALL, PENNSYLVANIA.

Latitude, 40° 40′ N.; longitude, 75° 26′ W. from Greenwich; elevation above tide-water, 250 feet; hours of observation, sunrise, noon, and sunset. Latest frost in spring, May 23; earliest frost in autumn, September 26; period without frost, 125 days. Observer, Edward Kohler.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	35.55	25.77	37 43	49.29	56.36	72.85	75.53	70 66	62.92	56.1	38.2	32.4	51.09
Therm'r, extremes {	56	46	66	77	76	90	88	90	85	86	64	52	....
	12	— 5	4	30	38	53	54	43	34	27	22	12	....

OTTAWA, ILLINOIS.

Latitude, 41° 20′ N.; longitude, 88° 47′ W. from Greenwich; elevation above tide-water, 500 feet; hours of observation, 7 A. M. and 2 and 9 P. M. Latest frost in spring, May 18; earliest frost in autumn, October 7; period without frost, 141 days. Observer, J. O. Harris, M. D.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	34.49	18.15	39.13	48.48	56.33	71.43	73.04	71.22	63.2	51.22	33 6	27.88	49.01
Therm'r, extremes {	57	42	71	80	76	93	91	94	87	80	51	53	....
	10	—12	4	30	40	51	60	47	42	31	11	— 3	....
Rain, inches........	1.67	3.15	2.98	4.55	8.36	6.58	4.82	2 37	3.56	3.97	2.35	2.55	46.91

PEKIN, ILLINOIS.

Latitude, 40° 36′ N.; longitude, 89° 45′ W. from Greenwich; hours of observation, 7 A. M. and 2 and 9 P. M. Latest frost in spring, April 26; earliest frost in autumn, October 20; period without frost, 176 days. Observer, J. H. Riblet.

	Jan.	Feb.	Mar.	Apr.	May	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	34.1	17.62	40.79	49.52	57.56	72.15	75.65	72.64	61.45	52.78	34.42	29.37	50.09
Therm'r, extremes {	59	44	[illegible]	81	82	92	94	94	86	83	52	51	....
	10	—16	0	30	40	49	62	48	42	30	7	— 4	....
Rain, inches........	0.95	1.55	3.73	7.66	11.49	6.96	8.62	3.31	3.78	3.32	6.18	3.19	60.74

PEORIA, ILLINOIS.

Latitude, 40° 36′ N.; longitude, 89° 30′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 6; earliest frost in autumn, November 13; period without frost, 220 days. Observer, FREDERICK BRENDEL, M. D.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean	35.64	19.62	42.0	52.45	59.72	76.27	78.0	75.92	67.59	53.48	36.29	32.39	52.45
Therm'r, extremes {	59	47	77	87	88	98	96	102	90	86	54	51	....
	13	—15	4	30	40	57	62	50	48	34	11	1.5	....
Rain, inches........	1.48	1.95	3.28	6.25	10.64	5.95	5.85	3.24	2.96	3.24	4.85	3.67	53.36

PHILADELPHIA, PENNSYLVANIA.

Latitude, 39° 57′ N.; longitude, 75° 11′ W. from Greenwich; elevation above tide-water, 60 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, March 27; earliest frost in autumn, September 23; period without frost, 179 days. Observer, Prof. JAMES A. KIRKPATRICK.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean	40.81	30.1	40.67	52.52	59.31	77.54	79.22	74.98	67.9	56.85	42.22	37.65	54.98
Therm'r, extremes {	61	51	70	84	78	95	95	90	87	90	66	57	....
	22	11	10	35	48	55	67	58	41	39	16	19	....
Rain, inches........	2.69	2.39	1.12	4.68	5.31	4.21	1.45	5.16	1.59	1.78	3.37	5.46	39.21

PITTSBURG, PENNSYLVANIA.

Latitude, 40° 30′ N.; longitude, 80° W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 26; earliest frost in autumn, October 13; period without frost, 169 days. Observer, WILLIAM MARTIN.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean	37.49	26.47	36.93	51.36	59.65	73.16	76.71	73.17	63.6	55.39	38.41	37.88	52.58
Therm'r, extremes {	63	45	66	74	78	90	91	89	86	81	59	64	....
	91	— 2	3	31	46	53	64	51	41	38	19	14	....
Rain, inches........	?	?	?	?	?	?	3.25	2.79	1.46	2.56	2.96	4.73	?

PLATTEVILLE, WISCONSIN.

Latitude, 42° 45′ N.; longitude, 91° W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 23; earliest frost in autumn, October 8; period without frost, 167 days. Observer, J. L. PICKARD, M. D.

	Jan.	Feb.	Mar.	Apr.	May	June.	July.	Aug.	Sept.	Oct.	Nov	Dec.	Annual.
Thermometer, mean	30.47	15.55	39.07	45.49	56.99	73.9	76.49	74.8	65.18	51.92	31.97	22.65	48.71
Therm'r, extremes {	55	50	70	85	87	97	96	102	92	88	56	42	....
	4	—19	— 2	22	40	52	62	48	48	29	— [illegible]	—18	....
Rain, inches........	2.29	0.6	1.66	4.43	[illegible].44	7.74	8.85	0.78	4.19	3.41	4.42	2.46	47.27

POCOPSON, PENNSYLVANIA.

Latitude 39° 54′ N.; longitude 75° 37′ W. from Greenwich; elevation above tide-water, 218 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 7: earliest frost in autumn, October 27; period without frost, 202 days. Observer, FENELON DARLINGTON.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	37 86	25 85	37 92	50.59	57.2	75.8	77.89	73.42	64.91	56.44	39.93	35.26	52.76
Therm'r, extremes.	62	48	68	81	80	96	94	90	87	87	65	61	....
	18	— 9	6	32	48	58	64	54	46	27	22	15	....
Rain, inches........	2.2	2.71	1.07	3.68	8.64	5.36	2.27	5.78	1.23	1 63	5.11	4.67	44.35

POMFRET, CONNECTICUT.

Latitude 41° 52′ N.; longitude, 72° 23′ W. from Greenwich; elevation above tide-water, 596 feet; hours of observation, 7 A.M and 2 and 9 P.M. Latest frost in spring, April 1; earliest frost in autumn, September 14; period without frost, 138 days. Observer, D. HUNT.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	29.74	20.85	30.71	43.66	51.8	66.56	66.89	64 31	58.63	50.93	33.14	26.92	45.35
Therm'r, extremes.	52	44	58	66	70	88	82	78	79	71	57	52	....
	5	3	1	27	39	44	53	50	37	30	14	6	....
Rain, inches........	2.95	1.51	3.0	4.12	2.58	4.22	5 37	6.23	5.05	2.77	1.42	2.63	41.85

POPLAR GROVE, VIRGINIA.

Latitude 38° 20′ N.; longitude 81° 21′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 27; earliest frost in autumn, November 16; period without frost, 202 days. Observer, JAMES E. KENDALL.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	43.85	32.47	42.63	56.77	63.74	73.61	76.2	73.83	65.67	57.24	41.1	44.0	55.93
Therm'r, extremes	71	66	77	85	90	98	94	94	93	85	66	66	....
	25	4	10	33	46	52	65	50	43	34	21	15	....
Rain, inches.... ...	?	?	?	?	2.81	1 94	3.6	3.94	0.63	4.13	3.28	?	?

PORT HURON, MICHIGAN.

Latitude 42° 53′ N.; longitude 82° 24′ W. from Greenwich; elevation above tide-water, 606 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, May 21; earliest frost in autumn, September 25; period without frost, 126 days. Observer, JAMES ALLEN.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean	30.05	18 69	31.59	44.75	51.67	68.75	71.35	69.79	63.97	52.52	38.17	32.11	47.79
Therm'r, extremes	57	49	61	72	77	97	92	92	90	76	58	55	....
	4	—13	—10	24	35	42	55	53	41	31	18	6	....

PORTSMOUTH, VIRGINIA.

Latitude, 36° 50′ N.; longitude, 76° 19′ W. from Greenwich; elevation above tide-water, 468 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 27; earliest frost in autumn, November 15; period without frost, 201 days. Observer, Prof. N. B. WEBSTER.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	46 96	39.03	45.36	57.02	64.85	76.99	79.71	77.47	69.41	62.62	45.83	46.14	59.28
Therm'r, extremes	68	64	77	90	94	98	100	100	96	90	73	75	....
	30	24	15	33	49	59	64	56	44	35	26	23	....
Rain, inches........	3.29	5.13	2.5	5.33	3.03	5.78	3.44	3.35	3.62	0.33	3.97	4.48	44.25

RICHMOND, INDIANA.

Latitude 39° 47′ N.; longitude, 84° 47′ W. from Greenwich; elevation above tide-water, 800 feet; hours of observation, 7 A.M and 2 and 9 P.M. Latest frost in spring, April 24; earliest frost in autumn, September 17; period without frost, 145 days. Observer, JOSEPH MOORE.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	37.87	24.2	38.18	51.49	58.28	71.91	74.68	69.36	62.4	53.44	37.02	38.41	51.44
Therm'r, extremes	56	53	67	75	81	91	89	92	87	80	56	60	....
	23	−8	−0.5	31	40	51	58	42	27	32	21	9	....
Rain, inches........	2.92	2.03	1.43	5.64	11.87	6.7	2.7	7.0	0.4	3.51	4.98	4.93	54.11

RILEY, ILLINOIS.

Latitude, 42° 8′ N.; longitude, 88° 33′ W. from Greenwich; elevation above tide-water, 650 feet; hours of observation, 7 A.M and 2 and 9 P.M. Latest frost in spring, May 21; earliest frost in autumn, September 10; period without frost, 111 days. Observer, E. BABCOCK.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	30.79	14.7	35.67	43.79	52.11	70.1	71.08	68.63	71.27	50.16	32.59	24.61	47.13
Therm'r, extremes	56	36	70	69	78	92	92	90	85	76	48	47	....
	0	−22	−4	25	36	46	54	41	36	30	0	−16	....
Rain, inches........	3.1	?	6.44	6.72	15.14	?	11.46	4.08	4.74	5.14	2.43	?	?

RIPLEY, OHIO.

Latitude, 38° 47′ N.; longitude, 83° 31′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, May 20; earliest frost in autumn, October 9; period without frost, 141 days. Observer, J. AMMEN.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	39.26	26.37	36.86	56.8	59.0	69.73	76.69	75.27	62.64	54.4	37.53	41.36	52.10
Therm'r, extremes	55	47	75	73	?	84	95	97	?	73	?	62	....
	25	−1	6	34	44	53	63	54	?	37	20	13	....
Rain, inches........	2.28	3.14	0.97	3.58	6.13	5.45	5.75	2.34	1.22	4.27	1.22	8.78	45.11

ROUGEMENT, VIRGINIA.

Latitude, 38° 5′ N.; longitude, 78° 21′ W. from Greenwich; elevation above tide-water, 450 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, March 10; earliest frost in autumn, November 14; period without frost, 248 days. Observer, GEORGE C. DICKINSON.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean	40.09	32.36	44.91	56.14	64.67	78.86	79.96	78.9	68.65	63.0	39.0	40.98	57.04
Therm'r, extremes	64	63	88	92	92	100	95	95	90	89	52	66	....
	23	11	8	34	50	57	68	60	45	44	25	11	....
Rain, inches........	1.91	2.03	1.34	4.22	5.66	4.83	5.02	1.55	2.31	1.64	3.17	6.07	39.75

RUPERT, VERMONT.

Latitude, 43° 15′; longitude, 73° 11′ W. from Greenwich; elevation above tide-water, 750 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, May 14; earliest frost in autumn, November 10; period without frost, 179 days. Observer, JOSEPH PARKER.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	28.21	21.07	32.43	44.0	58.0	73.82	74.43	70.59	64.8	54.1	34.34	24.93	48.39
Therm'r, extremes	46	58	66	64	82	94	96	90	86	74	62	44	....
	−4	−4	−6	20	28	52	58	50	36	34	12	−4	....

SACRAMENTO, CALIFORNIA.

Latitude, 38° 35′; longitude, 121° 40′ W. from Greenwich; elevation above tide-water, 49 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, March 28, earliest frost in autumn, October 10; period without frost, 195 days. Observer, T. M. LOGAN, M. D.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	45.03	52.24	53.74	59.8	66.27	69.43	70.9	70.57	68.9	59.31	54.23	44.47	59.58
Therm'r, extremes.	57	64	64	81	80	86	97	85	87	79	66	52	....
	33	36	43	46	55	61	59	61	55	43	39	29	....
Rain, inches........	2.45	2.46	2.88	1.21	0.21	0.1	0	0	0	3.01	0.15	4.84	17.31

SAG HARBOR, NEW YORK.

Latitude, 41° N.; longitude, 72° 20′ W. from Greenwich; elevation above tide-water, 40 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Earliest frost in autumn, November 12. Observer, E. N. BYRAM.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	37.16	28.38	36.23	48.37	56.01	70.13	72.66	70.43	65 62	57.44	40.73	35.76	51.58
Therm'r, extremes.	58	53	66	69	78	95	90	85	86	87	67	55	
	13	6	3	31	46	51	59	54	42	38	22	17	....

ST. LOUIS, MISSOURI.

Latitude, 28° 37′ N.; longitude, 90° 16′ W. from Greenwich: elevation above tide-water, 461 feet; hours of observation 7 A.M. and 2 and 9 P M. Latest frost in spring, March 8; earliest frost in autumn, November 14: period without frost, 250 days. Observer, A. WIZLIZENUS, M. D.

	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean	40 47	27.17	47.83	57.7	64.0	76.53	82.17	78.7	71.27	58.61	37.59	38.27	56.69
Therm'r, extremes.	62	55	76	81	88	95	99	98	93	89	57	56	....
	24	0	11	35	44	50	66	57	54	40	17	12	....
Rain, inches........	3.42	2.12	3.96	6.07	10.64	6.69	8.03	2.87	3.86	7.73	4.92	8.52	68.83

SALT PONDS, KEY WEST, FLORIDA.

Latitude, 24° 33′ N.; longitude, 81° 48′ W. from Greenwich; elevation above tide-water, 4 feet; hours of observation, 7 A.M. and 2 P.M. Period without frost, 365 days. Observer, WILLIAM C. DENNIS.

	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean	74.19	71.7	71.56	76.7	80.24	82.82	81.77	85.7	82.76	81.35	73.54	76.47	78.48
Therm'r, extremes.	83	83	83	85	88	89	90	92	90	88	86	84	....
	63	59	54	66	74	76	77	80	76	76	60	64	....
Rain, inches.......	1.5	2.35	1.66	0.21	3.43	7.31	3.85	2.38	6.55	0.83	2.09	0.79	32.95

SAVANNAH, GEORGIA.

Latitude, 32° 5′ N.; longitude, 81° 7′ W. from Greenwich; elevation above tide-water, 42 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, March 4. Observer, JOHN F. POSEY, M. D.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	55.37	50.17	57.57	66.87	74.73	79.9	81.5	80.63	72.67	70.04	52.63	58.13	61.11
Therm'r, extremes.	71	74	83	87	90	93	97	96	90	88	80	75	....
	38	35	27	44	61	68	70	69	56	54	34	36	....
Rain, inches........	3.15	4.56	2.82	1.99	3.63	2.9	5.77	3.32	14.2	1.54	3.37	5.95	53.22

SAVANNAH, OHIO.

Latitude, 41° 12′ N.; longitude, 82° 31′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, May 19; earliest frost in autumn, August 24; period without frost, 96 days. Observer, JOHN INGRAM, M. D.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	35.12	20.78	35.43	49.59	58.34	73.96	77.58	71.77	63.71	56.46	35.67	36.26	51.22
Therm'r, extremes.	60	53	67	74	84	98	97	96	90	87	60	63	....
	17	−14	− 8	26	37	48	54	44	35	31	15	8	....
Rain, inches........	2.44	3.3	1.42	5.99	7.15	5.73	6.92	3.71	1.85	2.55	4.68	5.98	51.72

SAYBROOK, CONNECTICUT

Latitude, 41° 80′ N ; longitude, 72° 20′ W. from Greenwich ; elevation above tide-water, 10 feet ; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 27 ; earliest frost in autumn, November 11 ; period without frost, 197 days. Observer, JAMES RANKIN.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	33.71	25.37	32.35	44.95	52.21	65.69	70.52	68.72	64.08	46 98	37.69	31.84	47.84
Therm'r, extremes {	49	44	52	60	66	83	86	84	81	76	61	49	....
	10	6	7	30	42	50	59	52	43	34	19	12	....
Rain, inches........	3.01	2.85	2.04	3.25	3.14	6.4	1.8	3.47	4.47	?	4.98	4.22	?

SHAMOKIN, PENNSYLVANIA.

Latitude, 40° 45′ N.; longitude, 76° 31′ W. from Greenwich ; elevation above tide-water, 700 feet ; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, May 29 ; earliest frost in autumn, August 24 ; period without frost, 86 days. Observer, P. FAHEL.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	35.24	23.26	35.94	45.63	54.33	69.27	71.0	65.61	58 81	53.33	36.25	32.69	48.46
Therm'r, extremes {	56	50	72	72	75	95	96	88	86	82	58	56	....
	16	— 8	— 5	13	27	40	36	28	21	11	10	3	....
Rain, inches........	1.8	0.86	0.95	3.06	7.3	2.91	5.68	3.76	1.57	2.7	3.79	4.12	38.5

SMITHFIELD, VIRGINIA.

Latitude, 36° 50′ N.; longitude, 76° 41′ W. from Greenwich ; elevation above tide-water, 100 feet ; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 26 ; earliest frost in autumn, October 28 ; period without frost. 184 days. Observer, JOHN R. PURDIE, M. D.

	Jan.	Feb.	Mar	Apr	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	45.71	37.65	45.61	57.53	64.6	75.24	77.58	75.52	67.38	60.98	41.57	43.0	57.7
Therm'r, extremes {	69	65	77	85	88	93	90	91	86	84	56	64	....
	25	20	11	36	52	62	66	57	44	32	25	19	....
Rain, inches........	2.1	3.52	1.41	4.51	4.49	4.92	3.5	3.21	4.27	1.06	4.09	6.66	43.77

SOMERSET, PENNSYLVANIA.

Latitude, 40° 2′ N.; longitude, 79° 2′ W. from Greenwich ; elevation above tide-water, 1,997 feet ; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, May 22 ; earliest frost in autumn, August 23 ; period without frost, 92 days. Observer, GEORGE MOWRY

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	33.99	23.12	34.12	47.17	56.01	69.21	72.68	68.92	61.48	53.27	34.69	35.7	49.19
Therm'r, extremes {	61	49	68	71	81	90	91	88	85	79	58	62	....
	9	— 1	— 2	22	42	48	58	46	36	34	15	8	....
Rain, inches........	0.54	2.22	1.13	3.96	8.39	4.03	3.97	1.32	1.34	2.06	3.91	?	?

SPARTA, GEORGIA.

Latitude, 33° 17′ N.; longitude, 83° 9′ W. from Greenwich; elevation above tide-water, 550 feet; hours of observation, 7 A. M. and 2 and 9 P. M. Latest frost in spring, April 28; earliest frost in autumn, October 15; period without frost, 169 days. Observer, E. M. PENDLETON, M. D.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean	50.26	45.55	55.13	62.9	71.82	77.44	79.02	78.81	70.82	66.16	46.73	53.16	63.15
Therm'r, extremes	67	68	83	87	90	94	94	98	92	89	70	77	....
	32	28	20	36	51	54	62	59	48	42	28	30	....
Rain, inches........	11.02	4.9	4.38	6.64	2.7	5.3	4.23	5.8	3.92	1.68	2.95	9.36	63.08

SPRINGDALE, KENTUCKY.

Latitude, 38° 7′ N.; longitude, 85° 34′ W. from Greenwich; elevation above tide-water, 570 feet; hours of observation, 7 A. M. and 2 and 9 P. M. Latest frost in spring, May 21; earliest frost in autumn, October 8; period without frost, 139 days. Observer, MRS. L. YOUNG.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	41.84	30.24	44.94	56.6	64.11	73.24	77.91	75.89	68.05	59.93	39.12	41.95	56.15
Therm'r, extremes	62	62	76	84	88	97	97	98	90	87	54	61	....
	21	—10	9	26	36	46	54	47	37	28	15	9	....
Rain, inches........	3 5	2.61	1.34	6.34	7.91	3.55	4.48	3.46	2.74	3.88	2.74	7.35	49.9

STANBRIDGE, CANADA.

Latitude, 45° 8′ N.; longitude, 73° W. from Greenwich; hours of observation, 7 A. M. and 2 and 9 P. M. Latest frost in spring, May 3; earliest frost in autumn, September 25; period without frost, 144 days. Observer, J. C. BAKER.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	19.58	13.14	24.29	40.63	52.0	67.48	67.94	65 6	57.79	45 06	28.15	16.54	41.52
Therm'r, extremes	44	42	56	60	78	90	88	83	83	73	47	41	....
	—13	—27	—22	20	33	51	54	47	33	23	11	—21	... .

STEUBEN, MAINE.

Latitude, 44° 44′ N., longitude, 67° 58′ W. from Greenwich; elevation above tide-water, 50 feet; hours of observation, 7 A. M. and 2 and 9 P. M. Latest frost in spring, June 1; earliest frost in autumn, August 24; period without frost, 83 days. Observer, J. D. PARKER.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	22.8	16.33	23.3	38.72	49.05	60.2	62.55	60.4	56.21	45.59	30.81	20.34	40.94
Therm'r, extremes	48	41	49	60	72	82	88	73	84	71	57	40	... .
	0	—10	9	29	33	47	52	47	37	22	9	—7	....
Rain, inches........	4.08	?	3.47	?	4.03	1.38	7.24	2.52	2.52	4,58	1.15	3.05	?

SYKESVILLE, MARYLAND.

Latitude, 39° 23′ N.; longitude, 76° 57′ W. from Greenwich; elevation above tide-water, 700 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 22; earliest frost in autumn, September 18; period without frost, 148 days. Observer, HARRIET M. BARR.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Thermometer, mean.	37.58	27.46	40.0	50.83	59.78	73.82	73.98	71.0	64.22	56.76	40.25	37 4	52.6
Therm'r, extremes.	60	54	71	76	81	89	89	85	84	76	68	62	....
	18	0	2	33	46	57	58	55	45	31	19	14	....
Rain, inches........	?	?	0.95	?	?	6.58	2.52	1.51	6.08	4.53	3.85	6.45	?

TARENTUM, PENNSYLVANIA.

Latitude, 4° 37′ N.; longitude, 79° 19′ W. from Greenwich; elevation above tide-water, 950 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 28; earliest frost in autumn, September 23; period without frost, 147 days. Observer, JOHN H. BAIRD.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	36.86	25.65	36.4	50.06	58.67	72.09	74.36	70.48	62.01	53 85	38.36	37.09	51.32
Therm'r, extremes.	68	54	72	80	82	91	91	90	89	82	61	62	....
	12	− 5	− 1	28	33	51	60	46	36	31	11	8	....

UNION HILL, TEXAS.

Latitude, 30° 30 N.; longitude, 96° 31′ W. from Greenwich; elevation above tide-water, 540 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, March 9; earliest frost in autumn, November 5; period without frost, 240 days. Observer, WILLIAM H. GAUTE, M. D.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	54.93	59.55	57.91	63.26	67.0	71.78	76.06	76.69	78.05	72.87	50.44	51.03	64.21
Therm'r, extremes.	71	72	72	76	90	93	99	98	96	93	76	75	....
	35	26	28	50	58	58	65	65	65	52	24	22	....
Rain, inches...	?	?	6.42	0.29	?	2.33	?	0.5	2.46	11.29	1.33	2.52	?

URBANA, OHIO.

Latitude, 4° 6′ N.; longitude, 83° 43′ W. from Greenwich; elevation above tide-water, 1,015 feet; hours of observation, 7 A.M and 2 and 9 P.M. Latest frost in spring, May 22; earliest frost in autumn, August 24; period without frost, 93 days. Observer, Prof. M G. WILLIAMS.

	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean	36.56	22.63	38.83	51.54	58.85	73.04	75.37	71.96	64.64	55.49	35.34	37.15	51.78
Therm'r, extremes.	60	54	73	80	83	97	90	94	90	86	59	57	....
	18	−12	− 2	31	40	51	59	47	38	33	13	5	....
Rain, inches........	2.05	1.48	0.96	3.87	7.5	5.26	3.6	4.36	1.97	1.78	3.39	4.8	41.02

WALLINGFORD, CONNECTICUT.

Latitude, 41° 26′ N.; longitude, 72° 50′ W. from Greenwich; elevation above tide-water, 133 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 27; earliest frost in autumn, September 24; period without frost, 149 days. Observer, B. F. HARRISON.

	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	32.14	22.92	32.42	48.8	53.16	68.4	69.54	66.68	60.79	52.49	34.24	28.32	47.49
Therm'r, extremes	52	47	65	72	73	92	89	83	84	84	61	51	....
	3	— 2	— 4.5	28	40	48	55	45	35	29	9.5	4.5	....
Rain, inches........	3.13	1.92	1.57	3.87	2.62	5.08	3.26	4.02	5.18	3.29	3.23	4.47	41.64

WASHINGTON, DISTRICT OF COLUMBIA.

Latitude, 38° 53′ N.; longitude, 77° 1′ W. from Greenwich; elevation above tide-water, 30 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, March 24; earliest frost in autumn, October 16; period without frost, 205 days. Observer, SMITHSONIAN INSTITUTION.

	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	40.15	31.01	41.92	53.42	60.89	76.37	78.26	74.7	66.5	58.39	41.49	39.91	55 25
Therm'r, extremes.	60	53	70	83	83	94	93	90	85	81	65	62	....
	24	13	9	34	49	60	65	57	46	33	27	19	....
Rain, inches........	1.65	0.44	1.75	3.97	7.48	1.81	5.6	2.64	2.9	2.54	4.19	5 79	40.76

WATERFORD, NEW YORK.

Latitude, 42° 48 N.; longitude, 73° 41′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, May 29; earliest frost in autumn, October 16; period without frost, 139 days. Observer, JOHN C. HOUSE.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	28.65	19.27	32.95	47.43	55.67	71.24	72.08	69.12	62.64	51.52	34.4	24.28	47.44
Therm'r, extremes.	49	44	63	69	76	91	91	85	89	73	61	44	....
	— 7	—13	— 3	31	42	51	57	52	37	28	13	— 3	....

WAYNESVILLE, ILLINOIS.

Latitude, 40° 16′ N.; longitude, 89° 7′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 26; earliest frost in autumn, October 21; period without frost, 177 days. Observer, J. C CANTRIL.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov	Dec.	Annual.
Thermometer, mean.	33.33	18.44	41.74	51.66	57.36	72.21	75 54	73 21	65 98	53.48	33.78	31.5	50.60
Therm'r, extremes.	57	44	76	78	78	93	93	97	88	83	50	48	....
	12	—18	0	25	36	48	54	46	41	31	7	0	....
Rain, inches........	?	1.05	?	5.75	7.13	6.0	3.88	1.63	4.0	2.63	3.38	2.23	?

WELCHFIELD, OHIO.

Latitude, 41° 23′ N.; longitude, 81° 12′ W. from Greenwich; elevation above tide-water, 1,115 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, May 18; earliest frost in autumn, August 23; period without frost, 96 days. Observer, B. F. ABELL.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	33.53	21.8	34.48	47.29	56.21	74.51	75.05	70.09	62.89	52.78	34.81	33.98	49.79
Therm'r, extremes.	60	53	70	71	80	97	101	90	88	81	60	58	....
	13	— 6	0	25	38	48	59	50	43	33	16	11	....
Rain, inches........	1.67	2.45	2.37	5.39	7.82	4.71	6.29	3.67	1.44	3.02	4.06	6.16	49.05

WEST ENFIELD, NEW HAMPSHIRE.

Latitude, 43° 30′ N.; longitude, 72° W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 26; earliest frost in autumn, October 25; period without frost, 181 days. Observer, NATHANIEL PURMORT.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	22.73	13.79	24.72	39.62	50.97	67 49	66.48	65.46	57.92	46.6	27.68	18.92	41.87
Therm'r, extremes.	47	45	58	60	72	94	90	83	84	72	52	42	....
	— 4	—10	—18	17	34	47	49	47	34	25	9	— 8	....
Rain, inches........	3 2	0.53	?	2.55	3.25	2.27	2.12	3.11	5.12	7.61	3.99	1.75	?

WESTERVILLE, OHIO.

Latitude, 40° 4′ N.; longitude, 83° 1′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, May 22; earliest frost in autumn, September 23; period without frost, 123 days. Observer, Prof. JOHN HAYWOOD.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	37.51	23.58	37.82	51.5	58.87	73.74	78.7	71.43	64.46	56.12	36.85	38.63	52.44
Therm'r, extremes.	58	52	69	74	80	94	91	91	88	83	60	62	....
	15	—10	— 7	31	41	52	62	52	44	34	18	10	....
Rain, inches........	1.56	1.85	1.03	5.64	7.15	4.57	2.8	8.47	1.74	2.34	3.15	5.1	45.4

WESTFIELD, MASSACHUSETTS.

Latitude, 42° 6′ N.; longitude, 72° 48′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 7; earliest frost in autumn, October 26; period without frost, 201 days. Observer, Rev. EMERSON DAVIS.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	29.93	21.07	32.02	46.22	53.22	67.72	68.84	65.4	59.36	49.9	33.74	25.58	45.75
Therm'r, extremes.	50	46	56	67	71	92	90	84	85	72	60	42	....
	0	— 3	— 2	29	37	43	52	49	34	28	7	— 3	....
Rain, inches........	3.41	2.2	1.07	3.53	3.3	4.2	5.08	6.25	4.04	3.75	2.41	3.88	43.12

WESTTOWN, PENNSYLVANIA.

Latitude, 39° 57′ N.; longitude, 75° 43′ W. from Greenwich; elevation above tide-water, 550 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 26; earliest frost in autumn, September 8; period without frost, 134 days. Observer, SAMUEL ALSOP.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean	36.52	25.34	36.8	48.47	56.41	73.61	75.06	70.69	63.2	55.99	38.39	34.74	51.29
Therm'r, extremes	59	47	66	80	76	93	93	88	84	86	62	63	....
	16	−8	5	32	45	53	62	53	41	29	22	15	....
Rain, inches........	2.42	1.3	?	4.13	9.05	5.2	2.59	3.92	1.23	2.17	5.07	3.95	?

WHEATON, ILLINOIS.

Latitude, 41° 49′ N.; longitude, 88° 6′ W. from Greenwich; elevation above tide-water, 682 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 26; earliest frost in autumn, October 7; period without frost, 163 days. Observer, G. H. COLLIER.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	33.04	15.53	36 0	45.56	54 16	70.46	72 61	76.98	62.75	51.29	32.97	26.54	48.16
Therm'r, extremes	58	39	70	73	78	91	91	93	86	79	51	46	....
	10	−22	−1	29	38	45	56	48	47	32	9	−8	....
Rain, inches........	2.3	2.14	2.8	4.68	6.72	3.69	3.15	8.23	4.05	3.55	4.82	5.25	51.38

WHITMARSH ISLAND, GEORGIA.

Latitude, 32° 4′ N.; longitude, 81° 5′ W. from Greenwich; elevation above tide-water, 18 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 28; earliest frost in autumn, November 10; period without frost, 195 days. Observer, B. T. GIBSON.

	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	54.65	49.4	56.64	66.36	74.05	78.64	80.28	80.38	73.02	70.18	53.45	57.49	66.21
Therm'r, extremes	70	69	80	84	86	89	94	92	87	84	79	74	....
	39	34	27	46	64	68	69	71	58	56	35	39	....
Rain, inches........	2.01	4.46	1.1	3.87	3.45	2.27	8.46	9.46	9.29	1.84	2.28	3.86	52.35

WINDHAM, OHIO.

Latitude, 41° 10′ N.; longitude, 81° 5′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 28; earliest frost in autumn, August 23; period without frost, 116 days. Observer, SAMUEL W. TREAT.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean	35.63	23.87	34.95	46.99	55.07	69.11	72.24	68.19	62.09	52.93	35.42	35.23	49.31
Therm'r, extremes	57	44	66	69	76	91	89	87	85	82	56	59	....
	16	−12	−2	25	38	49	58	44	40	34	16	10	....

WINDSOR, NOVA SCOTIA.

Latitude, 44° 59′ N.; longitude, 64° 7′ W. from Greenwich; elevation above tide-water, 200 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, June 20; earliest frost in autumn, October 12; period without frost, 113 days. Observers, Rev J. M HENSLY and Prof. H. HOWE.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	25.05	[illegible].67	30.31	38.45	47 23	60.95	63.52	63.19	57.74	45.96	33.99	22.31	42.12
Therm'r, extremes	49	43	52	61	76	85	87	82	87	70	58	43	....
	0	— 6	3	25	33	44	50	48	34	26	18	0	....
Rain, inches........	?	?	?	1.58	2.17	1.24	3.33	2.08	1.66	?	?	?	?

WINNEBAGO, ILLINOIS.

Latitude, 42° 17′ N.; longitude, 89° 11′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, May 21; earliest frost in autumn, September 13; period without frost, 114 days. Observer, JAMES W. TOLMAN.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	32.47	16.25	38.09	45.95	56.26	70.93	72.85	70.94	63.09	50.7	31.95	23.57	41.68
Therm'r, extremes	58	44	70	80	80	93	91	93	87	83	51	40	....
	9	—14	2	27	40	49	59	47	43	30	2	—17	....
Rain, inches.......	2.37	1.29	2.08	3.98	6.86	7.45	3.36	2.85	5.59	2.94	4.5	1.88	45.15

WIRT COURT-HOUSE, VIRGINIA.

Latitude, 39° 5′ N.; longitude, 81° 96′ W. from Greenwich; hours of observation, 7 A.M. and 2 and 9 P. M. Latest frost in spring, April 27; earliest frost in autumn, November 12; period without frost, 198 days. Observer, J. W. HOFF.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	39.29	27.54	38.92	53.5	61.63	74.95	75.36	72.89	64.4	55.66	37.64	40.25	53.5
Therm'r, extremes	66	55	74	82	86	94	92	93	88	80	60	64	....
	22	— 6	— 7	26	40	59	64	54	44	34	15	12	....
Rain inches........	?	?	1.01	5.11	8.46	5.38	3.98	3.42	0.44	5.82	3.97	9 61	?

WORCESTER, MASSACHUSETTS.

Latitude, 42° 16′ N.; longitude, 71° 48′ W. from Greenwich; elevation above tide-water, 536 feet; hours of observation, 7 A.M. and 2 and 9 P.M. Latest frost in spring, April 22; earliest frost in autumn, September 29; period without frost, 159 days. Observer, J. S. SARGENT.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Thermometer, mean.	31.91	23.09	32.69	46.13	53.61	69.03	70.06	66.34	60.5	53.37	34.92	28.65	47.53
Therm'r, extremes	54	41	64	67	73	92	92	81	85	75	61	52	....
	7	5	3	29	41	45	55	52	41	33	13	8.5	....
Rain, inches........	3.1	?	?	?	?	?	?	?	5.7	3.1	?	4.22	?

Register of the temperature and face of the sky, for each day of the year 1858, *at several points in Nova Scotia, Canada, and the United States.*

[EXPLANATION.—C, denotes that the weather was cloudy; F, fair; R, rainy; S, snowy.]

Jan. 1858.	Windsor, Nova Scotia.			Montreal, Canada.			Nantucket, Mass.			Rochester, N. Y.		
	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.
1	F. 30	F. 38	C. 35	F. 18	S. 28	F. 25	F. 39	F. 48	F. 46	C. 31	C. 33	? 31
2	F. 27	F. 30	F. 29	F. 15	F. 28	F. 30	F. 34	F. 44	C. 40	C. 28	C. 34	? 32
3	C. 21	F. 23	S. 18	C. 13	S. 21	C. 17	C. 38	F. 40	F. 43	C. 26	C. 40	? 41
4	C. 11	C. 31	F. 36	S. 26	F. 40	F. 39	F. 40	F. 41	F. 46	? 42	? 51	? 45
5	C. 38	F. 39	F. 16	F. 20	F. 10	F. 5	F. 43	F. 49	C. 42	F. 36	C. 35	S. 31
6	F. 4	C. 9	C. 9	C. 0	C. 6	S. 5	R. 36	S. 34	C. 34	S. 24	C. 29	C. 29
7	F. 8	S. 17	F. 11	C. 7	F. 11	F. 6	C. 37	C. 36	F. 26	F. 28	C. 25	C. 20
8	F. 3	F. 9	F. 8	C. 1	F. 7	F. 2	C. 18	F. 23	F. 21	C. 19	F. 22	C. 17
9	F. 10	C. 28	C. 35	C. 16	S. 25	F. 31	C. 30	R. 40	R. 43	C. 31	C. 39	F. 34
10	C. 32	F. 30	F. 22	F. 19	F. 20	F. 19	F. 36	F. 38	F. 32	? 20	? 34	? 31
11	F. 5	C. 31	R. 42	S. 33	C. 40	S. 40	C. 40	R. 47	R. 52	C. 41	C. 54	C. 41
12	C. 49	C. 48	C. 34	C. 35	F. 24	F. 17	F. 44	F. 48	F. 30	C. 37	? 36	? 31
13	C. 22	C. 31	F. 21	C. 5	C. 18	F. 26	C. 36	F. 41	F. 36	F. 34	C. 46	? 38

Jan. 1858.	Washington, D. C.			Memphis, Tenn.			Austin, Tex.			Hillsborough, Ohio.			Platteville, Wis.			San Francisco, Cal.		
	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.
1	F. 35	F. 55	F. 46	F. 47	F. 59	C. 55	F. 43	F. 64	F. 48	F. 42	F. 43	F. 34	F. 16	F. 27	F. 14	F. 55	F. 63	F. 58
2	F. 34	F. 47	C. 41	R. 42	R. 41	R. 41	C. 38	F. 46	F. 40	S. 31	C. 32	C. 31	F. 16	F. 30	F. 27	F. 55	F. 59	F. 47
3	C. 38	F. 48	F. 44	F. 33	F. 47	C. 38	C. 38	C. 45	F. 41	F. 25	F. 38	F. 36	F. 31	F. 50	F. 42	F. 47	F. 53	F. 48
4	F. 36	F. 54	F. 43	C. 38	C. 52	R. 49	R. 48	F. 51	F. 42	C. 33	F. 44	F. 37	F. 36	F. 42	F. 38	F. 45	F. 56	C. 51
5	C. 36	C. 44	C. 44	C. 48	C. 45	F. 41	F. 41	F. 60	F. 46	C. 34	R. 44	C. 35	F. 28	C. 40	C. 34	C. 52	C. 53	F. 48
6	C. 39	C. 52	C. 40	F. 35	F. 52	F. 44	F. 40	F. 70	F. 52	R. 33	R. 43	R. 40	C. 32	C. 32	F. 12	F. 41	F. 51	F. 45
7	F. 35	F. 45	[illegible]	C. 42	C. 48	C. 43	C. 42	C. 41	C. 41	F. 28	F. 33	F. 27	F. 4	F. 24	F. 12	F. 40	F. 54	R. 45
8	F. 27	F. 32	F. [illegible]	C. 37	C. 50	C. 47	C. 39	C. 50	C. 46	F. 23	? 34	C. 33	F. 16	C. 26	F. 25	C. 42	F. 53	F. 44
9	C. 30	C. 39	C. 39	C. 47	R. 51	R. 50	C. 50	C. 60	C. 58	C. 38	C. 42	? 40	F. 22	F. 34	F. 25	F. 42	F. 54	F. 48
10	C. 38	C. 46	C. 43	R. 49	C. 55	F. 54	F. 54	F. 67	F. 53	R. 40	R. 44	R. 47	C. 30	R. 38	R. 39	R. 48	R. 54	C. 49
11	R. 44	C. 56	F. 56	F. 46	F. 56	F. 44	F. 42	F. 64	F. 57	C. 55	R. 47	R. 42	S. 32	R. 34	F. 24	R. 50	F. 54	F. 48
12	F. 45	F. 51	[illegible]	C. 45	C. 58	F. 54	F. 46	F. 70	F. 59	F. 33	F. 44	C. 42	F. 24	C. 40	C. 40	R. 44	R. 59	R. 52
13	C. 40	C. 52	C. 45	F. 45	C. 49	F. 45	C. 48	C. 60	C. 56	F. 42	F. 45	C. 30	F. 17	F. [illegible]	F. 27	C. 48	F. 51	F. 45

14	F. 25	F. 35	F. 26	F. 25	F. 30	F. 23	C. 38	C. 42	F. 37	C. 33	? 45	? 33	C. 41	C. 47	C. 38	F. 43	C. 52	C. 51	C. 54	C. 56	C. 57	R. 34	R. 41	C. 39	C. 22	C. 35	C. 32	F. 40	C. 50	F. 44
15	F. 19	F. 24	F. 17	S. 11	S. 16	S. 18	F. 38	C. 43	C. 40	C. 33	S. 40	S. 41	C. 36	R. 41	R. 42	R. 53	R. 53	R. 47	C. 54	F. 60	C. 48	C. 41	C. 46	C. 51	S. 34	C. 36	C. 29	C. 47	C. 54	C. 53
16	C. 25	R. 34	R. 41	C. 35	C. 30	C. 33	R. 48	R. 55	C. 48	S. 43	S. 44	C. 32	C. 42	C. 52	[illegible]	C. 41	F. 47	F. 38	F. 37	F. 60	F. 49	C. 36	C. 34	C. 32	C. 18	C. 29	C. 19	C. 47	F. 54	C. 49
17	S. 38	S. 36	S. 30	R. 18	F. 14	F. 10	F. 40	F. 44	C. 36	C. 24	C. 26	C. 26	C. 35	C. 41	C. 37	F. 37	F. 53	F. 49	F. 43	C. 62	F. 48	C. 30	C. 33	C. 32	C. 24	C. 32	C. 19	F. 49	F. 58	F. 50
18	S. 24	C. 26	C. 24	F. 4	F. 11	F. 10	F. 34	C. 32	F. 28	C. 28	C. 33	C. 32	C. 35	C. 42	C. 40	F. 34	F. 51	F. 41	F. 43	F. 60	F. 52	C. 31	C. 34	F. 30	C. 8	F. 28	C. 19	F. 45	F. 54	F. 47
19	C. 20	C. 23	C. 17	? 3	C. 11	C. 11	F. 32	C. 37	C. 34	S. 28	S. 31	S. 26	F. 31	C. 43	C. 36	F. 34	F. 51	F. 46	C. 50	F. 65	F. 49	F. 27	C. 38	F. 37	F. 18	F. 29	F. 22	F. 43	F. 52	F. 48
20	F. 12	F. 24	F. 12	C. 6	C. 17	C. 21	F. 26	F. 35	F. 33	C. 25	C. 31	? 29	C. 32	C. 39	F. 34	F. 39	F. 58	F. 46	C. 50	F. 64	F. 55	F. 31	F. 40	F. 35	F. 17	F. 35	F. 32	C. 44	C. 48	R. 48
21	C. 14	C. 34	C. 36	S. 26	C. 37	F. 20	C. 33	F. 44	F. 40	? 29	? 42	? 36	FOG. 30	F. 42	F. 37	F. 40	F. 62	F. 49	C. 42	F. 64	F. 54	F. 31	F. 47	F. 43	F. 24	F. 39	F. 32	R. 48	R. 52	F. 48
22	C. 11	C. 6	F. 3	F. −1	F. 1	F. 0	C. 37	F. 29	F. 26	C. 21	? 22	? 20	F. 30	F. 46	C. 37	F. 40	C. 62	C. 54	C. 56	C. 62	C. 62	F. 38	F. 49	F. 44	F. 30	F. 45	F. 38	R. 46	R. 48	R. 45
23	F. 0	F. 13	F. 13	F. −13	F. 4	F. 6	F. 28	F. 33	F. 28	? 24	? 41	? 35	F. 24	C. 30	C. 35	C. 53	C. 60	R. 52	C. 62	C. 69	C. 64	F. 36	C. 51	F. 43	R. 38	R. 45	R. 43	F. 42	F. 50	F. 44
24	F. 23	F. 41	F. 30	F. 0	C. 34	C. 23	C. 35	C. 44	C. 41	C. 32	C. 40	C. 42	C. 35	C. 43	C. 42	C. 52	C. 55	R. 55	C. 65	C. 69	C. 60	R. 41	R. 50	C. 49	R. 44	R. 44	R. 44	C. 42	F. 51	F. 44
25	F. 29	C. 46	F. 36	R. 32	C. 38	C. 37	C. 43	C. 48	C. 44	R. 44	R. 57	R. 53	C. 42	F. 51	C. 50	C. 53	C. 59	F. 54	F. 46	F. 64	F. 52	R. 49	C. 58	C. 54	R. 46	R. 55	R. 43	F. 42	C. 49	C. 49
26	F. 27	C. 43	R. 44	R. 40	C. 43	C. 39	C. 45	C. 51	C. 48	C. 52	C. 48	C. 44	C. 51	C. 60	C. 58	C. 49	C. 58	F. 50	F. 54	F. 65	F. 56	F. 51	F. 52	C. 46	C. 38	C. 38	C. 36	C. 47	C. 54	F. 50
27	C. 43	C. 43	C. 30	C. 36	R. 24	C. 25	C. 40	F. 50	C. 43	C. 40	C. 34	C. 31	C. 48	F. 51	C. 46	C. 42	F. 58	F. 52	C. 50	C. 71	C. 61	C. 37	C. 41	C. 40	C. 32	F. 39	S. 36	C. 47	C. 54	C. 49
28	C. 24	C. ?	S. 22	R. 21	R. 22	R. 17	R. 40	R. 33	S. 35	R. 27	R. 29	R. 30	F. 39	C. 45	C. 40	F. 46	F. 56	F. 48	F. 49	C. 58	C. 53	S. 33	S. 35	C. 33	C. 36	C. 38	C. 29	F. 46	C. 49	F. 46
29	C. 28	C. 32	C. ?	R. 16	C. 24	C. 22	S. 29	R. 32	S. 31	R. 27	S. 26	S. 27	C. 36	C. 37	C. 34	F. 35	F. 46	F. 39	C. 50	F. 58	C. 54	C. 31	S. 33	C. 32	C. 24	C. 29	F. 24	C. 46	C. 51	C. 46
30	S. ?	S. ?	S. ?	C. 21	C. 25	C. 13	C. 31	C. 39	F. 31	S. 23	C. 19	C. 18	C. 32	F. 40	F. 32	F. 33	C. 57	C. 43	C. 49	C. 54	C. 50	F. 30	C. 32	C. 30	F. 20	C. 35	C. 29	F. 44	F. 55	F. 50
31	C. ?	C. ?	F. ?	F. −3	F. 1	F. 2	F. 23	F. 30	F. 24	S. 16	C. 19	? 20	C. 30	C. 36	F. 30	C. 40	C. 45	C. 38	F. 50	F. 59	F. 48	C. 28	F. 32	F. 27	C. 26	C. 35	C. 32	F. 44	F. 54	F. 59

Register of the temperature and face of the sky, &c.—Continued.

Feb. 1858.	Windsor, Nova Scotia.			Montreal, Canada.			Nantucket, Mass.			Rochester, N. Y			Washington, D. C.			Memphis, Tenn.			Austin, Tex.			Hillsborough, Ohio.			Platteville, Wis.			San Francisco, Cal.		
	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.
1	F. ?	F. 9	F. ?	C. 10	F. 10	C. 6	F. 20	F. 29	C. 32	? 18	F. 32	S. 29	C. 27	R. 38	R. 41	C. 35	C. 37	C. 36	F. 42	F. 54	F. 44	S. 25	R. 33	R. 33	C. 26	C. 32	S. 32	C. 45	F. 56	C. 54
2	C. ?	S. 23	S. 23	S. 14	S. 22	S. 20	R. 45	F. 50	F. 41	S. 31	S. 39	S. 33	C. 37	C. 48	F. 40	C. 38	F. 47	F. 40	F. 38	F. 58	C. 51	S. 32	R. 31	C. 32	C. 29	C. 30	F. 6	F. 57	F. 68	F. 62
3	C. 33	F. 33	C. 32	S. 25	F. 27	C. 28	C. 40	F. 45	F. 38	C. 32	C. 35	F. 30	C. 38	F. 44	C. 37	C. 36	C. 36	C. 34	C. 38	C. 41	C. 40	C. 31	F. 35	C. 32	F. −7	F. 6	F. −2	F. 53	C. 67	F. 58
4	C. 26	C. 31	F. 24	F. 18	C. 23	C. 20	C. 35	C. 44	C. 35	F. 14	F. 25	F. 19	C. 35	C. 38	C. 37	C. 31	C. 33	C. 29	C. 41	C. 46	F. 37	F. 19	F. 25	F. 21	F. −6	F. 10	F. 6	F. 53	F. 66	F. 54
5	C. 21	F. 24	F. 17	C. 13	C. 17	C. 19	C. 32	C. 33	F. 28	C. 10	C. 26	C. 20	C. 33	C. 35	F. 30	C. 26	F. 38	F. 35	F. 32	F. 54	F. 43	F. 13	F. 23	F. 21	F. −2	F. 20	S. 18	F. 49	F. 61	F. 53
6	C. 15	F. 18	F. 10	C. 10	F. 19	F. 11	F. 25	F. 35	F. 29	C. 22	C. 28	S. 28	F. 23	F. 34	F. 33	C. 37	C. 43	F. 40	F. 36	F. 62	F. 44	C. 23	F. 39	S. 38	S. 22	C. 28	C. 26	FOG. 44	F. 65	F. 50
7	F. 2	F. 28	C. 24	S. 17	S. 22	C. 25	C. 37	R. 38	C. 39	C. 23	C. 35	C. 30	C. 35	C. 49	F. 38	C. 36	F. 47	F. 39	F. 40	F. 62	F. 44	C. 30	C. 32	F. 29	F. 18	F. 28	F. 18	F. 47	F. 55	F. 46
8	C. 27	C. 30	F. 16	S. 17	F. 12	F. 7	F. 33	C. 38	F. 39	C. 21	C. 27	C. 23	C. 34	F. 42	F. 35	F. 32	F. 54	F. 49	C. 54	C. 68	C. 61	F. 23	F. 35	F. 31	C. 19	C. 27	C. 19	F. 46	F. 53	F. 44
9	F. 3	F. 13	C. 10	FOG. −3	C. 6	C. 17	F. 27	F. 34	C. 40	S.& R. 24	S.& R. 36	S.& R. 36	C. 31	F. 49	C. 51	C. 51	C. 57	C. 40	C. 63	C. 73	F. 44	R. 37	R. 40	S. 31	C. 11	C. 18	F. 6	F. 43	F. 55	F. 47
10	R. 25	C. 40	C. 27	F. 13	S. 20	F. 5	R. 45	F. 46	F. 29	C. 26	F. 17	? 8	C. 42	F. 40	F. 27	C. 30	C. 32	F. 27	C. 34	C. 42	C. 36	F. 16	F. 14	F. 7	F. 19	F. −6	F. 10	F. 42	F. 59	F. 49
11	C. 10	C. 8	C. −6	F. −12	F. −3	F. −5	F. 18	C. 21	F. 15	C. 4	C. 12	? 9	F. 16	F. 25	F. 23	C. 21	C. 32	R. 33	C. 34	C. 38	C. 39	F. 3	F. 15	F. 18	C. −9	C. 10	F. 5	F. 46	F. 54	F. 48
12	F. −2	C. 9	F. 6	FOG. −17	F. 0	F. −2	F. 13	C. 28	F. 21	C. 11	F. 23	? 13	C. 24	S. 28	C. 26	R. 33	R. 35	R. 35	C. 42	F. 58	F. 40	C. 19	C. 28	C. 27	F. −3	C. 18	C. 19	F. 47	F. 54	F. 47
13	C. 0	F. 9	F. 7	F. −11	F. −2	F. −6	C. 17	C. 26	C. 25	C. 14	? 18	? 14	C. 25	S. 33	S. 20	C. 37	C. 44	C. 40	F. 54	F. 67	F. 51	S. 24	C. 31	R. 36	C. 22	S. 24	F. 14	C. 48	C. 58	F. 49
14	C. −1	F. 16	F. 9	F. −7	C. 8	C. 5	S. 26	S. 32	S. 20	S. 11	C. 21	C. 16	S. 20	F. 33	F. 28	F. 30	F. 48	F. 42	F. 52	F. 74	F. 56	C. 26	F. 30	C. 20	C. 15	C. 25	F. 4	F. 49	C. 55	R. 54

15	C. 8	F. 19	F. 13	F. —2	F. 10	F. 6	C. 23	C. 25	F. 20	C. 15	F. 18	? 22	F. 29	C. 36	F. 30	F. 39	F. 53	F. 46	F. 52	F. 70	F. 42	C. 26	F. 31	F. 29	C. 0	F. 14	F. 6	R. 52	R. 59	R. 57
16	C. 8	C. 17	F. 15	F. 1	C. 11	F. 6	F. 17	C. 32	F. 18	C. 20	F. 15	C. 9	F. 21	C. 39	F. 32	F. 40	F. 59	F. 49	F. 38	F. 60	F. 51	C. 25	C. 27	C. 25	C. 3	C. 16	C. 10	R. 53	R. 57	R. 52
17	C. 2	C. 6	C. 12	F. —2	F. 9	F. 2	F. 12	F. 23	F. 19	C. 7	C. 13	? 5	F. 15	F. 22	F. 20	F. 35	F. 54	F. 48	F. 39	F. 70	F. 59	F. 14	C. 17	C. 18	C. 8	C. 25	F. 14	C. 56	F. 62	C. 54
18	C. 7	C. 13	? 7	C. —2	C. 5	F. 3	F. 13	C. 26	F. 18	C. 10	C. 15	? 9	C. 20	C. 29	C. 28	F. 48	C. 63	R. 54	F. 58	F. 78	C. 56	F. 15	S. 26	S. 24	C. 13	S. 24	S. 15	C. 51	C. 64	F. 54
19	C. 6	F. 15	F. 7	F. —9	F. 2	F. —1	F. 12	C. 25	S. 24	C. 2	C. 14	C. 12	C. 24	S. 22	S. 18	C. 38	C. 39	F. 34	C. 48	C. 66	C. 54	S. 3	C. 23	C. 16	C. 14	C. 26	F. 8	C. 54	C. 63	R. 59
20	C. —3	C. 22	C. 20	F. —1	C. 9	C. 13	HAIL. 29	R. 35	R. 32	C. 15	C. 25	C. 20	S. 20	C. 31	C. 24	F. 29	C. 46	F. 43	C. 58	F. 78	C. 68	F. 11	C. 21	F. 19	F. 4	C. 32	C. 26	C. 57	C. 67	F. 55
21	C. 22	C. 24	C. 21	C. 13	S. 24	C. 25	F. 24	F. 35	F. 34	C. 19	C. 27	C. 23	F. 15	C. 36	C. 35	C. 52	C. 36	C. 27	C. 64	C. 51	C. 34	S. 19	S. 27	S. 23	F. 2	F. 8	F. 0	FOG. 51	C. 58	C. 53
22	C. 24	C. 27	F. 12	F. 6	F. 12	F. 6	C. 30	C. 32	C. 25	C. 17	C. 20	C. 17	C. 29	C. 30	C. 25	C. 18	F. 26	F. 23	C. 28	F. 43	F. 36	F. 7	F. 19	F. 12	F. —13	F. 15	F. 0	C. 54	F. 61	C. 53
23	F. 2	F. 10	F. 8	F. —4	F. 11	F. 7	F. 18	F. 24	F. 19	F. 6	F. 20	F. 11	F. 15	F. 24	C. 21	F. 16	F. 34	F. 30	F. 28	F. 50	F. 39	F. 5	F. 18	F. 14	F. —8	F. 20	F. 10	C. 51	F. 63	F. 55
24	F. 9	F. 19	C. 10	F. —2	C. 21	C. 21	F. 20	F. 20	C. 26	F. 4	C. 36	C. 30	F. 13	C. 32	F. 26	F. 25	F. 43	F. 36	F. 37	F. 60	F. 42	F. 8	F. 31	F. 26	F. 18	F. 39	F. 30	F. 55	F. 68	F. 55
25	C. 16	C. 34	C. 33	S. 23	S. 33	C. 28	C. 36	F. 43	F. 33	C. 28	C. 32	? 24	F. 16	F. 40	C. 31	C. 34	F. 52	F. 41	F. 42	F. 73	F. 56	F. 23	F. 35	F. 31	F. 20	F. 43	F. 42	F. 56	F. 68	F. 59
26	F. 25	F. 28	F. 16	C. 20	F. 26	F. 17	F. 30	C. 38	F. 29	C. 25	? 31	? 27	C. 27	F. 39	F. 31	F. 32	F. 55	F. 49	F. 58	F. 84	F. 66	F. 23	F. 37	F. 32	F. 27	F. 50	F. 40	F. 54	F. 71	F. 61
27	F. 1	F. 34	C. 30	C. 23	C. 39	C. 32	F. 28	F. 41	F. 35	F. 34	? 48	C. 41	F. 25	F. 48	F. 39	F. 47	F. 68	C. 64	C. 58	C. 78	C. 66	F. 35	F. 50	F. 47	C. 38	C. 39	C. 31	C. 54	F. 60	F. 50
28	C. 32	C. 44	F. 34	S. 33	C. 34	S. 33	F. 39	F. 44	C. 40	C. 38	C. 35	C. 32	F. 35	F. 53	F. 49	C. 40	C. 34	F. 34	C. 49	C. 52	F. 47	R.&S. 48	R.&S. 33	R.&S. 31	F. 21	C. 27	F. 12	FOG. 48	F. 62	F. 51

Register of the temperature and face of the sky, &c.—Continued.

Mar. 1858.	Windsor, Nova Scotia.			Montreal, Canada.			Nantucket, Mass.			Rochester, N. Y.			Washington, D. C.		
	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.
1	C. 36	C. 44	R. 39	C. 28	C. 30	C. 24	C. 40	R. 43	R. 35	C. 28	C. 29	C. 19	C. 39	C. 41	C. 32
2	R. 42	R. 53	C. 40	S. 10	S. 20	C. 10	R. 36	C. 37	F. 30	C. 13	F. 15	? 14	F. 22	C. 26	C. 22
3	F. 28	? 32	C. 32	F. 2	F. 6	F. 1	F. 20	F. 28	F. 20	? 4	F. 21	C. 10	F. 18	C. 26	F. 23
4	S. 30	S. 29	S. 27	F. —8	F. 11	F. 3	F. 17	F. 26	F. 22	C. 5	S. 13	C. 9	F. 17	C. 23	F. 19
5	C. 25	C. 29	F. 23	C. -6	C. 11	C. 8	F. 15	F. 21	F. 16	? 2	F. 9	C. 10	F. 9	F. 19	F. 15
6	C. 20	S. 24	C. 30	C. 6	C. 14	C. 9	C. 14	F. 24	F. 20	? 10	C. 16	? 12	F. 10	C. 24	F. 22
7	C. 22	C. 30	C. 22	F. 8	C. 18	F. 15	F. 13	F. 30	F. 25	? 8	? 22	? 19	F. 18	F. 30	C. 28
8	C. 16	C. 30	C. 18	F. 6	F. 14	C. 10	C. 23	C. 30	S. 28	S. 17	C. 25	? 16	C. 26	C. 25	C. 23
9	F. 29	C. 37	C. 25	C. 12	C. 22	C. 15	C. 26	F. 30	F. 23	S. 17	C. 20	C. 20	C. 19	C. 29	C. 31
10	C. 24	C. ?	?	C. 12	C. 25	F. 21	F. 25	C. 36	F. 32	C. 24	F. 36	? 32	C. 25	F. 43	F. 33
11	C. ?	F. 37	C. 32	C. 22	C. 38	C. 24	F. 32	C. 42	C. 38	F. 37	C. 37	? 30	F. 40	F. 58	F. 44
12	C. 34	C. 27	F. 22	F. 10	C. 26	F. 22	F. 30	F. 37	F. 32	? 23	F. 39	? 32	C. 35	F. 43	F. 34
13	F. 14	F. 23	F. 17	F. 9	F. 21	C. 13	F. 33	F. 33	F. 26	? 24	? 36	? 32	F. 32	F. 48	F. 38
14	F. 3	C. 30	S. 30	C. 14	S. 22	C. 22	F. 35	C. 36	R. 30	C. 30	C. 45	C. 41	F. 36	C. 58	C. 53

Mar. 1858.	Memphis, Tenn.			Austin, Tex.			Hillsborough, Ohio.			Platteville, Wis.			San Francisco, Cal.		
	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.
1	F. 25	C. 33	F. 30	F. 33	F. 50	F. 32	C. 19	C. 22	C. 18	F. 2	F. 14	F. 6	FOG. 44	F. 55	C. 51
2	F. 24	C. 34	F. 30	F. 34	F. 64	F. 46	C. 9	C. 15	F. 11	F. —2	F. 15	F. 8	C. 51	F. 59	C. 51
3	F. 28	F. 37	F. 33	F. 42	F. 71	F. 60	F. 10	C. 18	F. 13	F. —1	F. 14	F. 10	C. 52	C. 58	F. 53
4	F. 31	F. 50	F. 44	C. 54	C. 72	F. 62	F. 4	F. 17	F. 15	C. 14	F. 28	F. 21	F. 51	C. 60	F. 51
5	C. 42	C. 54	C. 47	C. 64	C. 70	C. 65	F. 10	F. 18	F. 14	C. 21	C. 34	S. 20	C. 56	C. 66	F. 54
6	C. 53	C. 49	C. 40	C. 64	C. 65	C. 56	C. 11	C. 14	F. 11	C. 15	C. 34	C. 27	F. 53	F. 72	F. 58
7	C. 34	C. 34	C. 30	C. 47	C. 49	F. 46	F. 8	F. 26	C. 22	C. 28	C. 39	C. 29	F. 52	F. 69	F. 55
8	C. 29	C. 34	F. 35	F. 48	F. 62	F. 47	C. 22	F. 26	C. 25	C. 22	F. 30	F. 20	C. 52	C. 61	F. 51
9	C. 35	F. 50	F. 45	F. 40	F. 70	F. 58	F. 20	F. 29	F. 28	C. 19	F. 26	F. 30	C. 52	C. 58	F. 52
10	F. 43	F. 64	F. 62	F. 59	F. 80	F. 65	F. 24	C. 47	C. 49	C. 32	F. 46	F. 40	C. 52	C. 63	C. 52
11	F. 57	C. 67	C. 57	C. 64	F. 81	F. 66	F. 42	F. 45	C. 38	F. 30	F. 45	F. 32	C. 52	C. 57	F. 52
12	C. 50	F. 59	F. 52	C. 66	C. 78	F. 64	F. 29	F. 42	F. 39	F. 32	F. 54	F. 40	C. 54	R. 61	R. 54
13	F. 45	F. 70	F. 64	C. 64	C. 76	C. 68	F. 34	F. 50	F. 45	C. 36	R. 46	R. 45	F. 54	F. 58	F. 49
14	C. 50	C. 71	F. 65	C. 68	C. 70	C. 68	C. 50	F. 65	F. 59	R. 47	R. 60	R. 56	F. 45	F. 56	F. 50

15	F. 29	C. 32	C. 29	C. 35	C. 44	C. 37	F. 37	C. 45	R. 39	C. 41	C. 50	C. 49	C. 49	C. 69	C. 59	C. 62	C. 73	F. 67	C. 68	C. 73	C. 68	C. 54	C. 64	F. 59	R. 56	R. 70	R. 63	C. 48	F. 58	F. 51
16	C. 16	F. 36	C. 32	FOG. 37	C. 45	R. 41	R. 36	C. 44	C. 38	C. 49	C. 59	C. 52	C. 48	F. 70	F. 60	F. 62	C. 73	C. 67	C. 67	C. 71	C. 57	C. 54	F. 68	C. 62	R. 55	R. 62	R. 47	C. 49	R. 56	F. 46
17	C. 33	C. 42	C. 38	C. 42	C. 53	C. 43	C. 40	C. 50	C. 44	C. 54	C. 61	C. 60	C. 55	C. 68	F. 60	C. 57	F. 62	F. 56	F. 55	F. 70	F. 58	C. 40	C. 67	F. 49	R. 54	R. 56	C. 42	F. 42	F. 51	F. 44
18	C. 37	C. 48	R 45	F. 43	C. 45	C. 39	F. 45	F. 53	F. 45	C. 47	C. 45	? 43	F. 54	F. 70	F. 60	FOG. 50	C. 71	C. 62	C. 56	C. 64	F. 69	F. 45	F. 59	F. 55	F. 34	F. 60	F. 54	F. 42	F. 59	F. 50
19	C. 24	F. 28	F. 26	F. 30	F. 33	F. 27	F. 42	F. 40	F. 35	F. 36	F. 40	? 37	F. 47	C. 63	F. 56	C. 61	F. 75	C. 70	C. 68	C. 79	C. 70	C. 46	C. 56	F. 50	C. 42	F. 70	C. 56	F. 50	F. 63	F. 51
20	F. 23	F. 36	F. 38	F. 24	F. 42	F. 35	F. 38	F. 45	F. 35	? 33	F. 56	C. 52	F. 40	C. 61	F. 60	C. 67	C. 72	C. 67	C. 69	C. 77	C. 70	F. 45	C. 64	C. 59	C. 56	C. 65	F. 47	F. 48	F. 61	C. 50
21	C. 32	C. 40	R. or S 40	R. 38	R. 40	C. 39	C. 41	R. 44	R. 45	R. 51	F. 50	F. 38	C. 50	F. 65	F. 58	F. 57	C. 61	C. 55	C. 60	C. 69	C. 60	F. 52	F. 52	F. 41	F. 34	F. 41	F. 32	C. 51	F. 58	F. 49
22	C. 40	C. 43	F. 29	S. 29	S. 33	F. 25	F. 40	F. 48	C. 37	C. 35	F. 40	? 32	F. 43	C. 52	C. 50	C. 50	C. 48	C. 45	C. 53	C. 64	F. 53	F. 35	C. 43	C. 41	F. 28	F. 45	C. 38	F. 49	F. 61	F. 49
23	C. 21	F. 23	F. 24	F. 19	F. 38	F. 26	F. 33	F. 39	F. 33	? 29	? 39	C. 34	C. 40	C. 39	F. 39	F. 45	F. 58	F. 51	C. 50	F. 69	F. 58	C. 35	F. 46	F. 41	C. 32	C. 53	F. 42	F. 50	F. 58	F. 49
24	F. 17	F. 25	C. 21	F. 19	F. 33	F. 25	F. 34	F. 43	F. 38	? 29	? 46	? 40	F. 31	F. 52	F. 46	F. 46	F. 64	F. 55	F. 62	F. 76	F. 60	F. 34	F. 52	F. 47	C. 42	F. 56	F. 46	C. 51	R. 58	R. 53
25	C. 21	C. 30	C. 37	C. 30	C. 36	F 30	F. 35	F. 47	C. 40	C. 39	C. 48	C. 40	F. 36	C. 63	F. 57	F. 48	F. 70	F. 60	F. 51	F. 77	F. 63	C. 44	F. 58	F. 54	F. 35	F. 57	F. 57	F. 50	F. 58	F. 48
26	C. 24	C. ?	C 33	C. 27	F. 32	C. 28	F. 37	C. 42	F. 38	? 31	? 38	? 32	F. 45	F. 52	F. 50	F. 52	F. 74	F. 62	F. 63	F. 80	F. 68	F. 46	F. 61	F. 54	C. 41	F. 58	C. 50	C. 47	C. 56	C. 48
27	C. 35	R. 38	R. 35	C. 23	C. 35	C. 32	F. 35	F. 45	F. 38	? 30	C. 33	C. 35	F. 40	F. 59	C. 51	F. 60	F. 78	C. 68	C. 66	C. 78	C. 67	F. 49	C. 67	F. 54	C. 46	F. 52	F. 40	C. 50	F. 58	F. 48
28	C. 33	C. 39	C. 35	F. 30	F. 43	F. 39	C. 40	F. 50	F. 37	C. 34	? 47	? 33	F. 46	C. 55	C. 49	F. 61	F. 69	F. 61	C. 67	C. 80	? 72	F. 42	C. 47	F. 40	F. 34	F. 54	F. 42	F. 47	C. 56	C. 49
29	? 35	C. 36	C. 33	F. 31	F. 46	C. 41	F. 41	F. 51	C. 43	C. 35	? 54	? 41	F. 40	C. 53	F. 45	F. 54	F. 69	C. 63	C. 68	C. 66	C. 62	F. 36	F. 47	F. 44	C. 34	F. 56	F. 41	C. 53	C. 58	C. 57
30	C. 34	C. 35	C. 34	F. 40	F. 47	C. 40	F. 42	F. 45	F. 38	? 35	? 51	? 42	F. 41	F. 58	F. 49	F. 54	F. 67	C. 62	C. 68	F. 73	F. 60	F. 37	F. 54	C. 48	C. 36	C. 63	C. 46	C. 56	F. 61	F. 56
31	C. 33	C. 40	F 32	F. 38	F. 48	F. 41	F. 40	F. 46	F. 38	? 35	? 61	? 47	F. 35	F. 61	F. 49	C. 57	C. 00	C. 57	F. 60	F. 73	F. 63	C. 41	C. 58	C. 58	C. 44	C. 64	F. 47	FOG. 56	C. 63	F. 57

Register of the temperature and face of the sky, &c.—Continued.

Apr. 1858.	Windsor, Nova Scotia.			Montreal, Canada.			Nantucket, Mass.			Rochester, N. Y.			Washington, D. C.			Memphis, Tenn.			Austin, Tex.			Hillsborough, Ohio.			Platteville, Wis.			San Francisco, Cal.		
	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.
1	F. 27	F. 43	F. 31	F. 32	F. 51	F. 41	F. 40	F. 34	F. 40	? 41	F. 66	? 55	F. 41	F. 59	C. 52	C. 56	F. 65	F. 57	F. 60	F. 76	F. 60	C. 48	C. 47	C. 45	F. 40	C. 63	F. 49	R. 53	R. 58	R. 50
2	F. 30	C. 54	F. 39	C. 42	F. 57	F. 44	F. 42	C. 56	C. 46	C. 48	? 67	? 52	C. 47	C. 60	C. 56	F. 54	F. 70	F. 62	F. 70	F. 82	F. 66	F. 40	F. 60	F. 55	F. 46	F. 60	F. 58	C. 48	C. 57	F. 54
3	C. 42	C. 61	F. 38	C. 46	F. 53	F. 41	F. 47	F. 54	F. 48	? 47	F. 67	? 54	C. 55	C. 63	F. 60	F. 60	C. 80	F. 67	C. 65	F. 79	F. 67	F. 51	F. 65	F. 60	F. 55	C. 70	F. 50	C. 53	F. 60	F. 50
4	F. 35	F. 48	F. 36	C. 33	C. 50	F. 46	F. 45	F. 49	F. 41	? 57	C. 72	C. 53	C. 47	C. 65	F. 57	F. 63	F. 68	F. 59	C. 65	F. 79	F. 68	F. 60	F. 62	F. 54	C. 38	C. 46	C. 32	R. 52	F. 61	F. 51
5	F. 33	C. 47	C. 36	R. 45	C. 54	R. 49	C. 44	R. 50	C. 46	? 49	C. 62	? 43	F. 49	F. 67	F. 59	F. 56	F. 73	F. 60	? 62	F. 79	F. 69	F. 49	F. 60	F. 41	C. 22	F. 36	C. 28	F. 53	F. 59	F. 51
6	R. 40	R. 49	F. 44	C. 36	C. 43	F. 27	C. 45	F. 55	C. 44	C. 37	C. 36	C. 31	C. 48	F. 53	F. 44	F. 58	F. 74	F. 65	C. 67	C. 79	C. 69	F. 34	F. 45	F. 43	F. 23	F. 46	F. 37	F. 51	F. 58	F. 49
7	C. 37	C. 37	C. 33	C. 20	F. 35	F. 30	F. 35	F. 43	F. 39	? 29	? 40	? 35	F. 34	F. 51	F. 46	F. 59	F. 81	C. 73	C. 68	C. 72	C. 68	C. 34	C. 42	C. 43	C. 32	C. 40	R. 41	C. 51	R. 58	R. 55
8	C. 26	F. 34	F. 32	F. 31	C. 40	C. 36	F. 36	F. 50	F. 41	? 34	C. 48	C. 46	R. 46	C. 49	C. 47	C. 65	C. 60	F. 65	F. 63	F. 79	F. 61	C. 44	C. 68	C. 56	C. 40	C. 65	C. 42	F. 48	C. 53	F. 48
9	C. 30	C. 45	C. 32	R. 35	R. 33	C. 30	R. 42	C. 50	C. 46	C. 54	F. 67	F. 53	C. 49	F. 73	F. 68	F. 66	C. 79	F. 72	F. 62	F. 82	F. 71	F. 59	F. 71	F. 66	C. 88	C. 46	C. 44	F. 47	F. 62	F. 53
10	C. 32	C. 37	C. 33	C. 31	C. 38	F. 35	C. 48	F. 62	C. 44	C. 42	F. 47	? 41	C. 60	F. 80	F. 66	C. 72	C. 82	C. 72	C. 64	F. 74	F. 62	F. 57	C. 68	F. 60	F. 40	S. 46	S. 42	F. 54	F. 68	F. 58
11	F. 28	C. 30	C. 28	F. 32	F. 42	F. 37	F. 43	C. 49	C. 45	C. 36	C. 34	C. 38	C. 50	C. 51	C. 45	C. 61	F. 70	C. 62	F. 58	F. 69	F. 59	C. 60	C. 60	C. 58	S. 40	S. 42	S. 41	F. 58	F. 80	F. 59
12	F. 35	F. 46	F. 36	F. 35	F. 45	C. 42	C. 42	C. 47	C. 40	C. 40	C. 42	C. 40	R. 42	R. 46	R. 47	C. 49	C. 51	C. 46	C. 56	C. 70	F. 60	C. 59	C. 67	F. 52	S. 40	S. 38	S. 34	F. 57	F. 80	F. 55
13	C. 30	C. 46	R. 37	R. 37	C. 43	C. 41	R. 43	C. 57	C. 50	C. 43	C. 50	C. 47	C. 45	C. 57	C. 58	C. 45	C. 51	C. 44	F. 50	F. 72	F. 59	C. 45	C. 48	F. 45	C. 34	C. 46	C. 39	F. 51	F. 62	F. 51
14	R. 42	C. 46	C. 46	C. 38	C. 42	C. 41	C. 48	C. 55	C. 44	F. 39	F. 53	F. 46	C. 51	C. 53	C. 52	C. 46	F. 60	F. 54	F. 60	F. 67	F. 73	C. 38	F. 47	F. 45	C. 36	C. 50	C. 41	C. 59	C. 57	F. 52

15	C. 44	C. 46	C. 38	C. 43	C. 48	R. 42	C. 46	F. 57	F. 47	C. 44	C. 52	? 47	F. 50	C. 58	F. 23	C. 55	C. 76	C. 68	C. 68	F. 88	F. 75	F. 44	C. 60	F. 55	F. 38	C. 46	F. 38	C. 51	F. 58	F. 49
16	C. 35	C. 42	C 40	F. 43	C. 52	F. 42	F. 50	F. 56	C. 47	F. 42	? 57	? 45	C. 51	C. 57	C 54	C. 65	C. 69	F. 61	C. 69	F. 86	F. 75	C. 44	C. 56	F. 50	F. 36	F. 55	F. 44	F. 49	F. 58	F. 48
17	F. 41	C. 52	F. 36	F. 44	C. 46	F. 37	F. 50	F. 57	F. 45	F. 38	C. 52	F. 43	F. 47	C. 64	C. 56	C. 65	C. 76	C. 70	C. 74	C. 86	F. 75	C. 46	C. 57	C. 48	C. 42	F. 57	C. 46	F. 50	F. 61	F. 51
18	F. 37	C. 41	F. 35	F. 42	F. 49	F. 41	F. 48	F. 52	C. 44	C. 38	C. 52	? 44	C. 51	R. 56	R. 53	F. 67	C. 72	C. 72	C. 72	C. 68	F. 62	C. 47	C. 51	C. 49	R. 44	R. 55	R. 47	F. 52	F. 65	F. 52
19	C. 33	F. 39	F. 36	F. 37	F. 47	F. 40	C. 47	C. 54	C. 44	C. 42	C. 47	C. 44	C. 52	C. 53	C. 50	C. 63	C. 65	C. 63	F. 64	F. 82	F. 65	C. 48	C. 71	C. 63	R. 43	R. 54	R. 46	C. 51	F. 59	C. 51
20	F. 32	F. 39	F. 29	C. 37	C. 52	S. 37	C. 47	R. 44	C. 43	R. 45	R. 49	R. 46	C. 47	R. 51	R. 53	C. 62	C. 69	C. 60	F. 62	F. 74	F. 56	C. 61	C. 64	F. 58	C. 45	C. 56	F. 45	C. 52	F. 71	F. 53
21	C. 30	S. 31	S. 29	S. 35	C. 41	C. 37	C. 47	C. 45	F. 40	R. 41	R. 48	C. 45	C. 58	F. 64	F. 57	C. 56	C. 66	F. 60	F. 62	F. 85	F. 68	C. 46	F. 58	F. 54	C. 46	F. 64	C. 50	F. 53	F. 68	F. 53
22	S. 31	C. 36	C. 35	C. 42	C. 54	C. 51	F. 48	F. 55	F. 44	F. 48	C. 72	? 63	F. 50	F. 57	C. 61	F. 60	F. 78	C. 65	F 76	F. 90	F. 72	F. 53	F. 70	F. 65	C. 53	C. 55	C. 34	F. 56	F. 75	F. 56
23	F. 36	F. 48	C. 39	F. 55	C. 48	C. 45	F. 51	C. 57	C. 52	C. 47	C. 43	C. 38	C. 60	C. 65	C. 48	C. 49	F. 58	F. 49	F. 66	F. 69	F. 56	C. 40	C. 43	F. 40	C. 31	F. 42	C. 37	F. 61	F. 79	F. 61
24	R. 47	C. 57	F. 40	C. 35	C. 33	C. 34	C. 45	F. 52	F. 44	S. 32	S 35	C. 33	F. 44	C. 52	F. 44	C. 52	F. 66	F. 60	F. 64	F. 92	F. 80	F. 88	C. 43	C. 39	F. 33	C. 48	F. 34	F. 60	F. 81	F. 56
25	F. 36	C. 49	F. 36	C. 32	C. 39	F. 32	F. 48	F. 48	S. 35	C. 32	C. 38	C. 35	C. 41	C. 41	F. 43	C. 48	C. 62	C. 49	C. 61	F. 87	F. 76	F. 39	C. 44	C. 0	F. 34	C. 54	C. 37	C. 54	C. 60	F. 56
26	C. 36	C. 41	C. 39	C. 36	C. 43	C. 37	C. 39	F. 48	C. 42	? 35	? 45	? 38	C. 38	C. 41	C. 44	C. 47	C. 53	F. 47	C. 70	F. 76	F. 63	C. 36	C. 43	F. 43	C. 34	C. 58	C. 43	C. 53	F. 63	F. 53
27	C. 38	C. 39	R. 38	F. 45	C. 47	C. 41	S. & R. 37	S. 35	R. 36	? 36	? 50	? 41	C. 37	C. 49	F. 47	F. 45	F. 57	F. 52	F. 62	F. 76	F. 61	F. 35	F. 48	F. 44	F. 36	F. 65	F. 53	F. 55	F. 80	F. 50
28	R. 41	C. 45	F. 37	C. 39	C. 51	F. 43	C. 41	F. 52	F. 44	? 37	F. 54	? 43	F. 44	C. 58	F. 55	C. 54	F. 70	F. 62	C. 62	C. 84	C. 69	C. 43	F. 62	C. 56	F. 48	F. 66	F. 64	F. 52	F. 56	F. 48
29	F. 39	C. 52	C. 38	F. 47	F. 57	F. 49	F. 47	F. 55	F. 46	? 40	F. 62	R. 55	C. 54	F. 67	C. 58	C. 62	C. 73	F. 67	C. 68	C. 84	C. 72	F. 54	F. 78	F. 68	C. 64	F. 85	F. 70	F. 52	F. 60	F. 58
30	F. 35	C. 55	C. 39	C. 47	C. 48	R. 46	C. 48	C. 56	C. 50	R. 66	R. 61	R. 52	F. 56	C. 83	F. 70	C. 67	C. 80	F. 70	C. 76	F. 84	C. 76	F. 67	F. 77	F. 72	C. 52	C. 56	C. 50	C. 36	F. 58	F. 48

Register of the temperature and face of the sky, &c.—Continued

May, 1858.	Windsor, Nova Scotia.			Montreal, Canada.			Nantucket, Mass.			Rochester, N. Y.			Washington, D. C.		
	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.
1	C. 47	C. 46	C. 45	F. 48	C. 55	C. 45	F. 50	F. 57	C. 50	C. 48	C. 56	C. 51	F. 64	F. 83	C. 68
2	C. 42	F. 51	C. 41	F. 42	F. 48	F. 42	C. 49	C. 50	F. 44	? 40	? 49	? 45	C. 57	C. 57	F. 56
3	F. 36	F. 43	F. 34	F. 48	F. 51	F. 41	F. 44	F. 46	F. 42	? 41	F. 58	? 48	F. 57	C. 63	C. 57
4	F. 40	F. 52	F. 47	F. 46	F. 62	F. 51	F. 50	F. 57	F. 46	C. 52	C. 64	C. 59	C. 52	C. 60	R. 52
5	F. 53	F. 67	F. 55	C. 52	R. 62	C. 55	F. 52	C. 57	C. 52	C. 51	C. 70	C. 60	R. 56	R. 62	C. 54
6	C. 45	C. 64	C. 53	R. 56	C. 54	C. 50	C. 56	R. 54	C. 53	R. 53	R. 53	C. 52	F. 59	C. 69	R. 60
7	R. 49	C. 48	C. 42	F. 53	F. 60	F. 52	C. 50	C. 52	C. 48	? 49	? 68	? 50	C. 60	C. 64	F. 60
8	C. 41	C. 58	C. 46	C. 61	C. 69	F. 59	C. 45	C. 49	C. 44	? 50	F. 68	? 57	C. 57	C. 68	F. 60
9	C. 44	C. 57	F. 42	C. 59	C. 69	C. 58	C. 45	F. 55	C. 44	C. 63	C. 74	? 50	C. 57	C. 69	F. 64
10	C. 44	C. 52	C. 45	C. 47	C. 52	C. 45	C. 50	C. 56	C. 51	C. 42	F. 57	C. 52	R. 59	C. 70	C. 69
11	C. 47	F. 56	C. 46	C. 40	C. 55	C. 45	C. 50	C. 46	C. 52	R. 48	C. 55	C. 55	C. 64	F. 73	F. 61
12	R. 46	R. 50	R. 53	R. 46	R. 52	C. 42	C. 56	F. 62	F. 50	R. 47	R. 45	? 46	F. 56	C. 59	F. 58
13	C. 46	C. 58	C. 47	C. 49	F. 51	F. 42	C. 54	F. 62	F. 52	? 4	? 62	? 54	F. 57	F. 71	F. 61
14	C. 41	C. 46	C. 42	F. 47	F. 51	F. 47	F. 53	F. 63	F. 49	C. 50	F. 69	? 55	C. 60	C. 71	C. 59

May, 1858.	Memphis, Tenn.			Austin, Tex.			Hillsborough, Ohio.			Platteville, Wis.			San Francisco, Cal.		
	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.
1	C. 61	C. 77	C. 63	C. 62	C. 62	C. 64	C. 64	C. 59	C. 46	C. 45	C. 57	C. 47	C. 53	F. 69	F. 56
2	C. 63	C. 74	C. 66	C. 60	C. 65	F. 60	F. 44	F. 61	C. 57	F. 43	C. 59	C. 46	C. 57	F. 67	F. 53
3	C. 64	C. 69	F. 65	F. 64	F. 76	F. 62	C. 47	C. 71	C. 61	R. 42	R. 45	R. 46	C. 53	F. 59	F. 52
4	F. 58	F. 63	F. 59	F. 73	F. 84	F. 67	C. 55	C. 67	C. 55	R. 48	R. 54	R. 50	F. 52	F. 67	F. 57
5	C. 57	C. 63	C. 58	C. 68	F. 85	F. 72	C. 53	C. 54	C. 52	C. 51	C. 57	C. 50	F. 64	F. 75	F. 67
6	F. 60	C. 67	F. 58	C. 68	F. 84	F. 70	C. 52	C. 61	C. 57	C. 53	C. 60	F. 55	F. 69	F. 75	F. 59
7	F. 58	C. 72	F. 64	C. 72	C. 78	F. 68	F. 53	F. 66	F. 62	F. 52	C. 76	C. 62	F. 66	F. 65	F. 49
8	C. 62	C. 74	C. 67	F. 74	C. 84	C. 70	F. 59	C. 73	F. 66	R. 61	R. 61	R. 48	C. 49	F. 62	C. 52
9	C. 64	C. 68	C. 66	C. 66	C. 68	F. 55	F. 63	F. 73	C. 62	F. 44	C. 55	C. 43	C. 53	F. 63	F. 51
10	C. 65	C. 66	C. 51	F. 56	F. 75	F. 64	R. 48	R. 58	R. 46	C. 52	C. 54	C 44	C. 50	F. 62	F. 51
11	C. 54	C. 57	F. 56	F. 62	F. 72	F. 67	R. 53	R. 45	R. 41	C. 40	F. 54	F. 51	F. 53	F. 65	F. 57
12	F. 58	F. 69	F. 63	F. 69	F. 87	F. 67	F. 45	F. 59	F. 55	F. 50	F. 70	C. 58	C. 51	C. 57	C. 51
13	F. 65	F. 82	F. 72	C. 74	F. 86	F. 79	F. 53	F. 69	C. 00	R. 56	R. 69	R. 57	C. 53	F. 62	F. 50
14	F. 72	F. [illegible]	F. 75	C. 70	F. 87	F. 71	F. 62	C. 79	C. 59	R. 56	C. 60	F. 51	C. 54	C. 63	F. 52

15	F. 43	F. 53	F. 45	C. 46	F. 64	F. 48	C. 54	C. 63	C. 51	F. 57	C. 63	F. 48	F. 69	F. 76	C. 68	F. 72	F. 83	F. 72	C. 76	F. 85	F. 70	C. 59	C. 63	C. 56	C. 43	C. 58	C. 51	C. 54	F. 63	F. 52
16	C. 44	C. 48	C. 44	F. 46	F. 51	F. 42	C. 54	C. 58	F. 51	C. 40	? 53	? 47	R. 54	C. 59	C. 58	C. 71	C. 86	F. 75	C. 69	C. 84	C. 73	C. 44	C. 46	C. 47	C. 49	R. 48	R. 45	F. 53	F. 66	F. 52
17	C. 37	C. 44	F. 37	C. 45	C. 58	C. 46	F. 49	C. 54	C. 46	? 46	C. 57	C. 45	C. 59	C. 68	F. 65	F. 76	C. 81	F. 75	F. 70	C. 86	F. 73	C. 56	C. 77	C. 61	C. 41	C. 48	F. 47	F. 55	F. 62	F. 51
18	C. 39	C. 50	C. 42	R. 45	R. 47	R. 46	C. 45	R. 48	R. 44	C. 44	C. 48	F. 49	F. 63	C. 71	C. 59	C. 55	C. 58	C. 57	C. 61	F. 73	F. 66	C. 45	C. 55	F. 49	F. 43	F. 57	R. 52	F. 54	F. 65	C. 55
19	C. 43	C. 54	F. 40	C. 46	C. 59	C. 51	C. 46	F. 50	R. 44	? 44	C. 59	C. 49	C. 54	C. 62	C. 58	C. 60	F. 70	F. 64	? 85	? 77	? 73	F. 46	F. 62	F. 57	C. 48	C. 64	C. 45	R. 55	F. 70	C. 59
20	F. 39	C. 56	C. 41	R. 49	R. 52	R. 49	C. 47	C. 56	C. 48	C. 47	C. 54	? 49	C. 60	F. 70	F. 57	F. 63	F. 70	F. 60	C. 71	C. 88	F. 74	F. 54	C. 54	F. 50	F. 44	F. 58	F. 50	C. 58	F. 69	F. 56
21	C. 42	C. 45	C. 39	C. 46	C. 50	R. 46	C. 51	R. 49	R. 46	? 45	C. 57	F. 45	F. 52	C. 59	F. 56	C. 60	F. 67	F. 65	F. 77	C. 88	F. 75	F. 46	C. 58	F. 53	F. 46	F. 64	F. 57	C. 59	C. 60	F. 54
22	C. 41	? 44	? 41	C. 44	C. 57	F. 49	C. 46	C. 49	F. 46	? 45	C. 56	? 51	F. 52	F. 63	F. 57	F. 66	F. 83	C. 74	C. 77	C. 89	C. 74	F. 52	F. 63	F. 57	C. 56	C. 68	C. 60	F. 58	F. 64	F. 54
23	? 43	? 56	? 50	C. 55	C. 64	R. 55	F. 54	F. 60	C. 52	? 53	C. 65	C. 66	F. 60	C. 70	C. 66	F. 73	F. 87	F. 76	C. 76	C. 90	F. 73	C. 56	C. 80	F. 73	C. 62	C. 80	R. 70	C. 59	F. 67	F. 54
24	? 44	? ?	R. 44	C. 51	C. 59	C. 55	C. 56	C. 57	F. 56	R. 55	C. 60	? 56	C. 69	C. 78	C. 69	C. 74	C. 83	F. 76	C. 72	F. 91	C. 78	C. 69	C. 60	C. 61	C. 63	C. 71	C. 62	F. 57	F. 65	F. 50
25	R. 37	? 43	? 43	F. 57	C. 59	F. 53	F. 57	C. 55	C. 47	C. 52	C. 62	C. 57	C. 65	R. 58	R. 60	C. 65	C. 75	F. 74	F. 68	F. 88	C. 78	R. 60	C. 65	F. 65	C. 59	C. 68	C. 58	C. 54	C. 65	C. 52
26	? 44	? 59	? 46	C. 54	C. 69	C. 56	C. 49	C. 54	C. 48	C. 55	C. 57	C. 54	C. 57	C. 60	C. 58	F. 71	F. 82	F. 73	F. 74	C. 91	F. 80	C. 59	C. 70	F. 62	F. 56	C. 79	F. 65	C. 55	F. 64	F. 54
27	? 44	F. 57	? 44	C. 52	C. 70	F. 59	R. 48	R. 46	C. 48	C. 52	R. 59	C. 54	C. 54	C. 57	C. 54	F. 73	F. 86	F. 74	C. 78	C. 92	C. 82	F. 57	F. 70	F. 61	C. 63	F. 83	F. 73	F. 56	F. 65	F. 56
28	F. 43	F. 59	F. 44	F. 61	F. 69	F. 58	F. 50	F. 48	C. 45	F. 53	F. 69	? 59	C. 53	C. 53	F. 54	? 66	? 67	? 69	F. 78	F. 93	C. 80	F. 59	F. 73	C. 66	F. 71	C. 87	F. 67	F. 57	F. 67	F. 53
29	F. 38	F. 69	F. 46	F. 60	F. 73	F. 59	F. 48	F. 56	C. 44	C. 55	? 68	? 56	C. 49	C. 54	R. 50	C. 70	C. 81	C. 78	C. 81	F. 94	F. 80	C. 59	F. 73	F. 70	F. 58	C. 85	F. 67	F. 56	F. 69	F. 57
30	F. 42	F. 71	F. 54	F. 62	F. 72	F. 61	C. 46	C. 51	F. 46	C. 57	F. 77	C. 67	C. 52	C. 65	C. 60	C. 76	F. 88	F. 80	C. 79	F. 92	F. 79	C. 68	C. 72	F. 68	C. 65	R. 67	R. 57	F. 57	F. 65	F. 53
31	F. 45	F. 77	F. 55	F. 67	C. 77	C. 68	F. 54	F. 63	F. 50	C. 63	F. 81	F. 65	C. 60	C. 66	R. 60	F. 77	C. 82	C. 71	C. 80	F. 92	F. 79	C. 71	C. 69	F. 66	C. 56	F. 75	F. 59	F. 55	F. 68	F. 53

Register of the temperature and face of the sky, &c.—Continued.

June, 1858.	Windsor, Nova Scotia.			Montreal, Canada.			Nantucket, Mass.			Rochester, N. Y.			Washington, D. C.		
	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.
1	F. 49	F. 76	F. 49	F. 66	F. 75	F. 66	F. 57	F. 67	C. 54	? 56	? 71	F. 51	C. 60	C. 72	F. 67
2	FOG. 46	C. 63	C. 55	F. 68	C. 75	C. 67	C. 53	F. 57	C. 51	? 58	? 77	C. 65	F. 65	F. 77	F. 68
3	C. 55	C. 62	F. 55	F. 60	F. 70	F. 65	C. 58	F. 63	F. 58	? 61	C. 78	C. 68	C. 65	C. 73	R. 66
4	F. 54	F. 64	F. 51	C. 60	R. 65	R. 64	F. 66	F. 67	C. 58	C. 67	C. 83	C. 68	C. 68	C. 80	F. 70
5	C. 54	C. 64	F. 59	C. 63	F. 71	F. 62	C. 61	C. 67	C. 56	F. 61	F. 72	F. 65	C. 72	C. 82	F. 75
6	FOG. 53	C. 72	F. 62	C. 59	C. 64	F. 60	C. 65	F. 66	F. 60	R. 65	R. 66	? 64	C. 74	C. 82	F. 74
7	C. 69	C. 82	F. 67	F. 61	C. 80	C. 72	C. 60	C. 67	C. 58	? 67	? 86	C. 74	F. 71	C. 82	F. 75
8	F. 66	F. 85	F. 64	F. 66	C. 71	F. 61	C. 59	C. 68	C. 58	F. 59	C. 68	? 64	F. 78	F. 86	F. 76
9	F. 54	C. 71	C. 61	C. 56	C. 63	C. 58	C. 60	C. 69	C. 60	C. 61	C. 69	C. 59	F. 74	F. 87	F. 78
10	C. 61	C. 67	C. 59	R. 57	R. 62	R. 57	C. 63	C. 70	C. 62	R. 62	C. 81	? 70	F. 77	C. 86	F. 80
11	C. 69	C. 73	C. 61	C. 58	C. 65	F. 56	F. 65	F. 72	C. 63	R. 56	R. 55	C. 55	F. 80	F. 87	C. 73
12	F. 56	C. 64	C. 54	C. 59	C. 63	F. 60	C. 54	C. 55	C. 59	C. 55	R. 56	R. 53	C. 71	C. 75	C. 65
13	C. 48	C. 49	R. 44	C. 55	R. 57	C. 57	C. 58	C. 58	C. 52	R. 56	R. 51	C. 54	C. 60	R. 68	C. 66
14	C. 47	C. 55	C. 49	C. 57	C. 65	F. 58	C. 52	C. 52	C. 57	? 52	? 70	? 61	R. 60	C. 66	C. 61

June, 1858.	Memphis, Tenn.			Austin, Tex.			Hillsborough, Ohio.			Platteville, Wis.			San Francisco, Cal.		
	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.
1	C. 69	C. 74	F. 69	C. 79	F. 95	F. 77	F. 63	F. 72	F. 67	F. 56	F. 75	C. 68	F. 54	F. 70	F. 51
2	C. 71	C. 89	F. 79	F. 84	F. 92	F. 78	F. 64	C. 76	C. 66	C. 66	C. 68	F. 63	F. 57	F. 63	F. 54
3	F. 81	F. 88	F. 80	C. 80	F. 93	F. 78	C. 60	C. 76	F. 74	C. 62	C. 73	C. 69	F. 60	F. 66	F. 56
4	F. 81	C. 91	C. 73	C. 80	F. 86	C. 62	C. 76	R. 85	R. 68	C. 64	C. 68	F. 62	F. 57	F. 69	F. 53
5	R. 70	C. 66	C. 63	C. 63	C. 76	F. 78	C. 67	C. 72	C. 67	F. 56	C. 76	F. 66	F. 55	F. 62	F. 59
6	C. 66	F. 74	F. 68	F. 76	F. 90	C. 77	R. 63	F. 71	F. 67	F. 65	C. 80	R. 74	C. 55	F. 64	C. 53
7	F. 71	F. 82	F. 74	C. 80	C. 91	F. 78	F. 67	F. 77	F. 72	F. 62	C. 68	F. 60	C. 53	F. 63	C. 54
8	F. 77	F. 88	C. 79	F. 78	F. 83	F. 76	F. 68	C. 81	F. 73	C. 60	C. 70	R. 62	C. 55	F. 60	C. 56
9	F. 79	C. 84	C. 79	C. 78	C. 90	C. 77	F. 70	R. 83	R. 75	C. 66	C. 76	R. 64	C. 58	F. 60	C. 57
10	C. 78	C. 88	R. 78	C. 74	C. 90	C. 75	C. 72	C. 80	C. 71	C. 58	C. 69	F. 58	C. 55	C. 63	C. 55
11	C. 72	C. 74	C. 66	C. 69	C. 83	C. 70	C. 64	C. 57	C. 58	F. 56	F. 69	F. 58	C. 55	C. 65	F. 55
12	C. 64	C. 69	F. 62	F. 66	F. 79	F. 66	R. 54	R. 60	R. 58	F. 52	F. 73	F. 58	C. 56	C. 66	C. 56
13	F. 63	C. 72	C. 64	C. 70	C. 88	F. 70	C. 51	C. 60	F. 58	F. 60	F. 82	F. 63	C. 57	C. 64	C. 56
14	F. 66	C. 73	C. 68	C. 68	F. 86	F. 76	F. 54	C. 67	F. 62	F. 64	F. 77	F. 65	C. 57	C. 63	C. 56

15	C. 52	C. 59	C. 49	F. 60	C. 71	F. 63	C. 52	C. 57	C. 52	? 56	C. 78	? 66	C. 63	C. 72	F. 65	F. 68	C. 81	F. 71	F. 80	F. 82	F. 78	F. 58	F. 72	F. 64	C. 64	C. 75	F. 67	C. 57	C. 62	C. 57
16	C. 50	C. 65	C. 58	F. 61	C. 68	F. 64	C. 53	C. 62	C. 54	C. 62	F. 80	? 71	C. 64	F. 72	F. 65	F. 71	C. 84	F. 76	C. 80	F. 93	F. 76	F. 59	F. 75	F. 70	C. 62	C. 79	F. 63	C. 56	F. 65	F. 58
17	C. 57	F. 68	F. 57	C. 64	C. 79	F. 71	C. 54	F. 65	C. 56	? 67	F. 83	? 72	C. 61	C. 75	C. 70	F. 75	F. 86	F. 75	C. 79	F. 78	F. 77	F. 65	F. 79	F. 72	F. 72	F. 93	F. 78	F. 56	F. 65	F. 56
18	? 67	? 73	? 58	F. 73	C. 80	C. 67	C. 64	F. 74	F. 64	? 70	F. 87	? 78	F. 72	F. 83	F. 76	F. 75	F. 85	F. 77	C. 72	F. 92	F. 78	F. 69	F. 80	F. 74	F. 75	F. 90	C. 77	F. 56	F. 71	F. 56
19	F. 58	F. 67	F. 54	C. 61	C. 66	F. 61	F. 65	F. 72	F. 58	? 70	F. 85	? 80	C. 75	C. 87	C. 87	C. 77	F. 83	F. 77	F. 78	F. 92	F. 76	C. 71	F. 83	F. 74	F. 74	F. 91	F. 76	F. 58	F. 66	F. 54
20	F. 54	C. 69	? 58	C. 62	C. 77	C. 70	F. 68	F. 78	C. 66	? 71	F. 87	? 75	F. 78	F. 85	F. 79	C. 76	F. 86	C. 75	C. 78	C. 94	C. 81	F. 68	F. 80	F. 74	F. 74	F. 90	F. 77	C. 58	F. 67	F. 56
21	F. 55	C. 75	F. 62	F. 68	F. 78	F. 69	F. 72	C. 70	C. 62	? 72	? 83	? 76	F. 74	F. 88	F. 87	C. 72	C. 85	F. 78	C. 81	C. 85	C. 76	F. 70	F. 84	F. 75	F. 75	F. 94	F. 80	F. 58	F. 70	F. 55
22	F. 52	F. 69	F. 58	F. 67	C. 80	F. 68	F. 64	F. 73	F. 57	? 74	F. 90	? 75	F. 79	F. 88	C. 75	C. 73	C. 84	F. 79	C. 82	C. 88	F. 80	F. 72	C. 86	F. 77	F. 80	F. 95	F. 82	F. 58	F. 69	F. 54
23	F. 48	F. 73	F. 58	? 68	? 81	? 76	F. 66	F. 75	C. 64	? 75	? 88	? 80	C. 72	F. 79	F. 76	F. 80	C. 89	F. 81	C. 82	C. 95	F. 81	F. 75	F. 86	F. 78	F. 82	C. 94	C. 80	F. 57	F. 68	F. 56
24	C. 57	C. ?	C. 58	F. 74	C. 89	C. 79	C 63	F. 74	F. 65	? 76	F. 94	? 80	F. 76	F. 88	F. 81	F. 81	F. 91	F. 81	C. 80	F. 96	F. 80	F. 75	F. 87	F. 80	C. 75	C. 87	C. 75	C. 59	F. 69	F. 54
25	C. 59	C. 70	C. 65	? 78	? 89	? 76	C. 64	F. 76	C. 69	? 78	C. 91	? 78	F. 78	F. 90	F. 80	F. 82	F. 90	F. 81	C. 82	F. 95	F. 83	F. 76	C. 85	F. 78	C. 78	C. 90	C. 75	F. 58	F. 74	F. 58
26	C. 63	C. 71	C. 63	? 75	? 85	? 80	C. 70	F. 76	C. 70	? 78	? 90	F. 81	F. 80	C. 92	F. 84	F. 82	F. 91	F. 82	F. 76	C. 85	C. 73	F. 76	C. 88	F. 82	C. 76	C. 90	F. 80	F. 58	F. 65	F. 56
27	C. 63	C. 75	F. 67	C. 73	F. 83	F. 79	C. 64	F. 68	C. 62	C. 76	? 90	? 80	F. 82	F. 92	C. 82	F. 84	F. 92	F. 82	C. 76	C. 84	C. 76	F. 79	F. 82	F. 76	F. 78	C. 96	F. 83	F. 57	F. 64	F. 54
28	C. 68	C. 78	C. 64	C. 76	F. 85	F. 74	C. 64	F. 65	F. 66	F. 76	F. 91	? 79	F. 81	C. 92	F. 88	F. 84	F. 91	F. 81	C. 74	C. 90	C. 78	F. 73	F. 86	F. 78	F. 81	F. 97	F. 83	F. 56	F. 66	F. 54
29	F. 61	? 68	? 61	F. 72	C. 76	C. 64	F. 71	F. 75	F 66	? 76	F. 89	? 81	F. 83	C. 92	F. 87	F. 81	F. 91	C. 78	F. 80	F. 95	F. 82	F. 74	F. 86	F. 83	F. 83	C. 96	F. 80	F. 54	F. 66	F. 52
30	? 60	? 67	? 53	F. 69	F. 75	F. 62	F. 69	F. 74	F. 65	? 76	? 81	? 75	F. 85	F. 94	C. 86	C. 78	C. 90	C. 80	F. 78	F. 93	F. 80	F. 79	F. 92	F. 81	C. 81	R. 86	C. 76	F. 57	F. 69	F. 55

Register of the temperature and face of the sky, &c.—Continued.

July, 1858.	Windsor, Nova Scotia.			Montreal, Canada.			Nantucket, Mass.			Rochester, N. Y.			Washington, D. C.		
	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.
1	? 53	? 56	? ?	F. 65	F. 72	F. 68	F. 63	F. 67	F. 60	F. 67	C. 73	C. 67	F. ?	F. 83	F. ?
2	? 57	? ?	? 56	C. 69	F. 76	F. 71	F. 68	F. 76	F. 62	F. 70	C. 86	F. 73	F. 80	C. 90	C. 84
3	? 54	? 69	? 55	C. 70	C. 84	C. 75	C. 64	R. 70	C. 65	? 77	? 86	? 77	F. 83	C. 93	F. ?
4	R. 54	R. 56	R. 52	C. 73	C. 72	F. 62	C. 68	C. 73	F. 65	? 71	? 87	? 83	F. ?	C. 89	C. ?
5	C. 52	C. 59	F. 54	F. 60	F. 69	F. 64	F. 64	F. 68	F. 59	? 65	F. 74	? 66	F. 77	F. ?	F. ?
6	F. 59	F. 74	F. 65	F. 67	F. 80	F. 66	F. 68	F. 74	F. 62	F. 65	F. 85	? 76	C. ?	F. 78	F. 71
7	F. 67	F. 87	F. 71	F. 72	F. 85	F. 76	C. 65	F. 73	F. 62	C. 74	C. 90	F. 80	F. 66	F. 80	F. 72
8	F. 67	F. 79	C. 64	C. 74	C. 67	C. 62	F. 68	F. 77	C. 66	? 77	? 90	C. 81	F. 68	C. 87	F. 78
9	C. 61	C. 67	C. 59	R. 58	C. 66	C. 60	C. 68	C. 80	C. 70	? 74	? 87	? 79	C. 81	F. 90	F. 83
10	C. 59	C. 79	C. 73	C. 60	C. 73	C. 71	C. 74	C. 79	C. 68	F. 80	F. 90	F. 80	F. 82	F. 91	F. 84
11	C. 69	C. 70	C. 58	C. 59	C. 65	C. 60	F. 74	F. 80	C. 71	R. 68	R. 64	R. 64	F. 83	F. 91	F. ?
12	C. 56	C. 66	C. 54	R. 54	R. 57	C. 57	C. 71	F. 80	R. 72	R. 59	R. 58	R. 59	F. 80	C. 88	C. 77
13	C. 55	C. 60	C. 62	R. 61	C. 68	C. 64	C. 72	F. 78	F. 72	C. 61	C. 67	? 61	C. 70	C. 78	C. ?
14	F. 73	F. 84	F. 76	C. 62	C. 74	C. 67	C. 74	C. 77	C. 69	? 62	? 74	F. 70	C. 73	C. 81	C. 75

July, 1858.	Memphis, Tenn.			Austin, Tex.			Hillsborough, Ohio.			Platteville, Wis.			San Francisco, Cal.		
	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.
1	C. 82	C. 79	F. 79	C. 80	F. 93	F. 82	F. 77	R. 90	R. 74	C. 80	C. 96	C. 78	F. 60	F. 82	F. 59
2	C. 81	F. 91	F. 81	C. 82	F. 92	C. 82	C. 74	F. 87	C. 75	C. 76	C. 94	C. 75	F. 64	F. 78	F. 54
3	C. 82	F. 90	F. 83	C. 76	F. 90	C. 81	C. 75	F. 88	C. 78	C. 72	C. 84	F. 70	C. 57	F. 63	F. 55
4	C. 82	C. 90	C. 75	C. 78	C. 85	F 76	C. 74	C. 81	F. 74	F. 70	F. 86	F. 75	F. 57	F. 68	F. 54
5	C. 81	C. 81	F. 78	F. 82	C. 94	F. 82	F. 75	F. 78	F. 75	F. 70	F. 86	F. 70	F. 55	F. 65	F. 53
6	F. 76	C. 88	F. 80	F. 84	F. 96	F. 83	F. 71	C. 88	F. 80	F. 70	F. 90	F. 80	F. 57	F. 63	F. 53
7	F. 81	F. 88	F. 80	F. 82	F. 96	F. 82	F. 71	F. 85	F. 77	F. 78	C. 94	C. 79	F. 56	F. 67	F. 55
8	F. 83	F. 90	F. 80	F. 84	F. 96	F. 78	F. 69	F. 85	F. 76	C. 74	C. 86	F. 78	F. 58	F. 66	F. 54
9	F. 82	C. 78	F. 76	C. 79	C. 86	F. 80	F. 73	F. 87	F. 77	C. 72	C. 82	C. 68	F. 54	F. 67	F. 53
10	F. 80	C. 76	C. 76	C. 80	C. 94	F. 82	F. 73	C. 86	C. 80	C. 70	C. 80	C. 68	F. 55	F. 73	F. 54
11	C. 76	C. 82	C. 74	C. 82	C. 94	F. 75	C. 74	C. 80	C. 67	C. 66	C. 72	C. 64	F. 60	F. 70	F. 53
12	F. 73	F. 80	F. 72	C. 73	F. 86	F. 89	C. 61	C. 67	F. 64	C. 64	C. 70	C. 68	C. 58	F. 64	F. 54
13	C. 75	F. 86	F. 78	F. 79	F. 92	F. 80	F 62	F. 72	C. 68	F. 62	C. 84	F. 68	F. 57	F. 66	F. 54
14	F 80	F. 89	F. 80	F. 77	F. 90	F. 76	F. 64	F. 76	F. 73	C. 64	C. 86	C. 72	C. 57	F. 66	F. 56

15	F. 74	C. 82	C. 70	C. 65	C. 80	F. 70	C. 68	C. 73	C. 65	? 65	F. 81	? 71	F. 70	C. 74	F. 71	F. 79	C. 90	F. 77	C. 78	F. 92	F. 80	F. 69	F. 83	F. 76	C. 76	C. 88	F. 76	C. 62	F. 67	F. 56
16	C. 69	C. 84	F. 67	F. 70	C. 79	C. 72	C. 69	C. 70	C. 65	F. 78	C. 80	? 71	F. 72	F. 83	F. 77	C. 78	F. 91	F. 81	C. 79	F. 92	F. 80	C. 70	C. 84	F. 78	C. 76	C. 88	F. 76	C. 55	F. 67	F. 51
17	C. 66	C. 83	F. 69	F. 78	F. 82	F. 70	C. 67	F. 74	C. 66	C. 72	C. 69	C. 71	F. 75	F. 85	F. ?	F. 82	F. 93	C. 83	C. 80	F. 91	F. 80	C. 73	C. 83	C. 73	C. 74	C. 90	C. 76	C. 56	F. 65	C. 54
18	C. 65	C. 64	F. 62	F. 66	F. 76	F. 67	C. 70	R. 73	F. 67	F. 64	F. 74	? 67	F. 78	C. 89	C. 78	F. 84	F. 92	C. 80	F. 80	F. 92	F. 80	C. 70	F. 76	F. 69	F. 68	C. 84	C. 74	C. 55	F. 65	C. 56
19	F. 60	F. 68	C. 61	F. 66	C. 75	F. 67	F. 72	F. 76	F. 66	F. 59	F. 81	F. 68	C. 66	C. 77	F. 75	F. 83	F. 90	F. 83	F. 80	F. 93	F. 85	F. 64	F. 80	F. 75	R. 68	C. 85	C. 75	C. 58	F. 66	C. 56
20	F. 61	F. 72	F. 62	C. 64	C. 72	C. 65	F. 74	C. 80	C. 68	C. 66	C. 76	F. 71	C. 72	C. 76	F. 73	F. 84	F. 91	F. 83	F. 82	C. 95	C. 81	C. 71	F. 82	F. 77	F. 71	C. 91	F. 77	C. 57	F. 64	F. 55
21	F. 56	F. 74	F. 63	C. 65	C. 78	F. 64	F. 74	F. 79	C. 68	F. 67	C. 84	F. 67	C. 72	C. 82	F. 78	F. 86	F. 94	F. 75	F. 80	F. 94	F. 84	F. 72	F. 81	F. 76	F. 68	C. 92	F. 77	C. 55	F. 65	F. 54
22	F. 59	C. 74	C. 58	C. 62	C. 68	C. 60	C. 66	F. 73	F. 66	C. 65	C. 77	F. 67	F. 73	F. 84	C. 77	R. 76	C. 79	C. 77	F. 80	F. 96	F. 83	F. 71	F. 78	C. 73	F. 70	C. 84	C. 74	C. 54	F. 65	C. 54
23	C. 55	C. 67	C. 56	C. 59	C. 66	F. 59	F. 68	F. 74	F. 63	C. 63	F. 72	F. 64	C. 72	C. 83	C. 75	C. 76	C. 88	F. 77	F. 83	F. 98	F. 86	C. 67	C. 73	F. 70	F. 69	F. 86	F. 70	C. 55	F. 66	C. 55
24	C. 56	C. 60	C. 53	C. 57	C. 69	C. 60	C. 67	F. 70	C. 62	F. 67	F. 76	F. 61	F. 72	F. 78	F. 73	F. 76	F. 85	F. 76	F. 81	F. 97	F. 86	F. 63	F. 74	F. 68	F. 68	C. 92	F. 74	C. 55	F. 69	F. 54
25	C. 51	C. 61	F. 54	F. 64	C. 67	C. 61	C. 60	C. 61	F. 58	C. 60	F. 74	F. 65	F. 65	F. 78	F. 73	F. 77	F. 86	F. 76	F. 81	F. 97	F. 84	F. 62	F. 76	F. 72	C. 70	C. 82	F. 72	F. 56	F. 65	C. 54
26	F. 50	F. 74	C. 55	F. 63	C. 76	C. 70	F. 62	F. 69	F. 59	F. 65	C. 87	F. 74	F. 70	F. 80	F. 74	F. 79	C. 90	C. 81	F. 81	F. 96	F. 84	F. 66	F. 82	C. 77	F. 64	C. 81	F. 69	C. 55	C. 59	C. 54
27	C. 57	C. 64	R. 60	F. 78	C. 77	C. 69	F. 66	C. 70	F. 66	C. 72	C. 81	F. 79	F. 74	F. 86	F. 82	F. 81	F. 90	F. 80	C. 78	F. 94	F. 84	F. 72	F. 83	F. 78	O 66	F. 79	C. 68	C. 55	F. 63	C. 54
28	C. 65	C. 66	? 59	F. 65	F. 72	F. 66	F. 70	F. 78	F. 68	C. 64	C. 74	C. 67	F. 74	F. 85	F. 82	F. 80	C. 94	F. 83	F. 80	F. 96	F. 84	F. 73	C. 87	F. 78	C. 68	C. 85	C. 74	C. 56	F. 61	C. 55
29	F. 58	C. 68	F. 56	C. 59	C. 62	C. 59	F. 70	C. 74	C. 68	F. 62	C. 64	C. 61	F. 79	F. 92	F. 84	C. 77	F. 91	F. 81	C. 73	F. 96	F. 84	F. 75	C. 74	C. 74	C. 74	C. 84	F. 70	C. 56	F. 61	C. 55
30	F. 59	C. 72	C. 62	C. 57	C. 69	C. 64	C. 66	F. 71	R. 61	C. 72	C. 84	C. 67	F. 80	C. 74	? 77	F. 74	F. 89	F. 83	F. 81	F. 96	F. 80	C. 69	C. 80	F. 75	F. 74	F. 90	C. 81	C. 56	F. 65	F. 55
31	C. 57	C. 71	C. 63	C. 66	C. 74	F. 76	C. 66	C. 73	F. 62	C. 64	F. 76	F. 68	F. 74	F. 78	F. 76	F. 82	F. 94	F. 83	C. 82	F. 96	C. 80	F. 70	F. 85	F. 78	C. 74	R. 90	C. 71	C. 55	F. 71	C. 54

Register of the temperature and face of the sky, &c.—Continued.

Aug. 1858.	Windsor, Nova Scotia.			Montreal, Canada.			Nantucket, Mass.			Rochester, N. Y.			Washington, D. C.		
	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.
1	F. 58	F. 64	F. 59	C. 61	F. 72	F. 65	F. 68	F. 75	F. 64	F. 65	F. 78	F. 70	F. 72	C. 80	C. 73
2	C. 56	R. 62	R. 58	C. 56	F. 69	F. 63	F. 66	F. 66	C. 66	C. 67	C. 84	F. 70	C. 73	C. 77	? 73
3	C. 58	C. 72	C. 60	C. 66	C. 78	R. 60	F. 64	C. 67	C. 60	C. 62	C. 69	C. 70	C. 70	C. 82	C. 76
4	C. 54	F. 70	C. 56	C. 61	R. 66	R. 64	R. 60	R. 67	R. 66	R. 71	R. 82	? 83	F. 77	C. 86	F. 83
5	R. 60	C. 64	C. 65	C. 64	C. 75	C. 68	C. 68	F. 74	C. 65	F. 70	F. 80	F. 74	F. 78	F. 90	F. 80
6	C. 64	C. 69	C. 59	C. 69	C. 75	F. 67	F. 70	F. 81	F. 70	? 69	? 74	F. 73	F. 79	F. 86	F. 81
7	C. 61	C. 60	F. 58	F. 63	F. 74	F. 67	C. 66	F. 67	F. 64	C. 71	C. 82	? 72	F. 76	C. 84	F. 80
8	C. 59	F. 71	F. 63	F. 75	F. 80	F. 70	F. 67	F. 69	F. 62	F. 67	? 85	? 74	F. 72	F. 80	F. 75
9	C. 60	C. 72	C. 67	C. 69	F. 75	C. 73	C. 63	C. 66	R. 60	F. 71	F. 89	? 75	R. 70	C. 84	F. 78
10	C. 65	F. 83	C. 71	C. 75	F. 83	F. 75	C. 62	C. 68	C. 60	C. 73	? 80	? ?	C. 69	C. 83	F. 76
11	C. 69	? ?	? 71	F. 69	R. 75	C. 70	C. 66	F. 73	C. 66	C. 73	C. 86	R. 69	F. 73	F. 86	F. 81
12	? 69	? ?	R. 71	F. 69	F. 77	F. 68	C. 68	R. 70	C. 68	C. 70	F. 75	? 70	C. 74	C. 86	C. 78
13	? 66	? ?	? 72	F. 63	F. 79	F. 70	C. 66	C. 66	C. 61	? 60	? 83	? 72	F. 75	F. 80	F. 73
14	? 55	? 73	? 64	F. 67	F. 80	F. 72	C. 62	C. 65	C. 69	? 68	? 80	? 73	C. 67	C. 74	C. 69

Aug. 1858.	Memphis, Tenn.			Austin, Tex.			Hillsborough, Ohio.			Platteville, Wis.			San Francisco, Cal.		
	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.
1	F. 82	F. 95	F. 81	F. 82	F. 97	F. 83	C. 71	C. 85	C. 70	C. 71	F. 86	F. 73	C. 59	F. 65	C. 56
2	F. 79	F. 94	F. 81	F. 82	F. 96	F. 82	R. 68	F. 83	F. 78	C. 76	C. 86	C. 78	C. 55	F. 65	F. 54
3	F. 83	F. 94	F. 83	C. 80	C. 95	F. 82	F. 72	F. 81	C. 72	C. 74	C. 92	F. 76	C. 55	F. 65	C. 54
4	F. 83	C. 95	C. 77	C. 78	C. 92	F. 80	C. 67	F. 83	F. 77	F. 78	F. 94	F. 78	C. 57	F. 64	C. 56
5	F. 79	F. 92	F. 83	F. 80	C. 94	C. 81	C. 75	F. 88	F. 77	F. 82	C. 102	F. 84	C. 58	F. 68	F. 56
6	F. 82	F. 92	F. 82	C. 80	F. 93	F. 85	F. 71	F. 88	F. 76	F. 86	F. 98	F. 84	C. 57	F. 63	F. 57
7	F. 81	F. 92	F. 84	F. 80	F. 94	F. 80	F. 74	F. 87	F. 75	F. 82	F. 98	F. 73	F. 57	F. 66	F. 55
8	F. 83	C. 89	F. 84	F. 76	F. 93	F. 83	F. 76	C. 75	C. 74	F. 76	F. 94	F. 83	C. 57	F. 65	C. 56
9	F. 82	F. 84	F. 83	F. 78	F. 95	C. 76	C. 69	C. 83	F. 74	F. 80	F. 98	F. 82	C. 57	F. 66	C. 56
10	F. 83	F. 93	F. 76	C. 75	C. 92	F. 82	F. 72	F. 87	? 74	R. 78	R. 96	R. 78	C. 57	C. 66	C. 56
11	C. 76	C. 83	F. 77	F. 78	C. 92	F. 80	F. 74	F. 87	F. 75	R. 72	F. 92	F. 78	C. 56	C. 63	C. 54
12	C. 75	C. 87	F. 78	F. 78	C. 90	F. 81	F. 72	C. 79	F. 72	C. 76	C. 90	F. 79	C. 56	F. 67	C. 56
13	C. 74	C. 86	F. 81	F. 81	F. 94	F. 84	F. 71	F. 82	F. 75	F. 76	C. 98	F. 82	C. 57	C. 65	C. 57
14	F. 76	C. 91	C. 74	F. 81	F. 98	C. 86	F. 71	F. 81	F. 75	F. 80	C. 90	F. 72	C. 59	F. 69	F. 59

15	? 72	? 75	? 71	C. 65	C. 80	F. 69	C. 67	C. 74	C. 66	C. 68	C. 70	? 73	C. 70	F. 78	F. 74	F. 76	C. 84	F. 72	F. 81	C. 84	F. 80	F. 72	F. 82	F. 74	F. 68	C. 86	F. 74	F. 58	F. 67	F. 56
16	? 70	? 63	? 61	F. 60	F. 71	F. 61	C. 67	F. 77	F. 65	F. 68	? 79	? 68	F. 71	F. 85	F. 77	C. 73	C. 86	F. 77	F. 80	C. 94	F. 84	F. 71	F. 81	F. 74	F. 68	C. 86	F. 74	C. 57	C. 62	C. 57
17	? 58	? 74	? 61	F. 59	F. 79	F. 70	C. 68	F. 74	F. 68	? 64	? 85	? 70	F. 76	F. 88	F. 81	F. 77	C. 89	F. 79	F. 79	C. 92	F. 85	F. 70	F. 86	F. 78	C. 71	C. 96	F. 80	C. 58	F. 68	C. 57
18	C. 63	C. 80	F. 69	F. 69	C. 84	C. 80	C. 71	F. 77	C. 68	F. 71	R. 66	R. 63	F. 78	C. 87	C. 75	F. 79	F. 89	C. 80	F. 77	C. 94	C. 83	C. 66	F. 83	F. 72	F. 66	F. 78	F. 65	C. 57	F. 67	F. 57
19	C. 71	C. 74	C. 63	C. 55	C. 59	C. 55	C. 68	F. 73	C. 66	C. 55	C. 60	C. 55	C. 71	F. 77	F. 70	F. 75	F. 82	F. 71	F. 84	F. 96	F. 86	C. 65	? 77	? 66	F. 60	C. 78	C. 68	C. 58	C. 65	C. 56
20	F. 52	? 66	F. 53	C. 53	C. 65	R. 59	F. 62	F. 69	C. 63	F. 55	C. 76	F. 67	F. 60	C. 79	C. 73	F. 71	F. 84	F. 75	F. 80	F. 98	F. 88	? 66	C. 76	C. 71	C. 70	F. 81	F. 67	C. 56	F. 64	C. 57
21	C. 51	C. 54	C. 56	C. 56	C. 68	C. 63	C. 65	F. 75	C. 67	F. 62	C. 76	C. 67	C. 75	F. 81	C. 76	F. 74	F. 90	F. 82	F. 78	F. 98	F. 88	C. 68	C. 78	C. 72	C. 60	C. 78	F. 64	C. 57	C. 62	F. 57
22	C. 56	C. 65	C. 60	C. 55	C. 64	C. 55	C. 68	? 74	F. 65	C. 62	C. 69	F. 66	C. 72	C. 79	F. 70	F. 76	C. 84	F. 73	F. 78	F. 94	F. 84	F. 64	F. 72	F. 63	F. 54	F. 74	F. 58	F. 58	F. 66	F. 56
23	F. 56	C. 63	F. 53	C. 54	C. 58	F. 52	F. 60	F. 66	F. 60	F. 54	F. 66	? 54	F. 59	F. 70	F. 62	C. 70	C. 78	F. 69	F. 76	C. 96	C. 76	F. 57	F. 66	F. 58	F. 52	F. 72	F. 60	F. 56	F. 71	F. 58
24	F. 49	F. 67	C. 57	C. 61	R. 61	F. 58	F. 60	F. 70	F. 61	? 62	? 73	F. 62	F. 57	F. 75	F. 67	C. 66	C. 79	F. 71	F. 74	F. 91	F. 75	F. 53	F. 68	F. 62	C. 61	F. 80	F. 64	F. 59	F. 64	C. 54
25	F. 56	F. 65	F. 51	F. 52	F. 64	F. 57	F. 62	F. 72	F. 60	? 55	? 74	? 64	F. 60	F. 79	F. 71	F. 71	F. 85	F. 79	F. 77	F. 92	F. 83	F. 56	F. 73	F. 66	C. 60	C. 76	C. 68	C. 56	F. 64	C. 56
26	F. 49	F. 66	F. 50	F. 54	C. 75	F. 65	F. 62	F. 71	F. 58	F. 63	F. 80	C. 71	F. 61	F. 77	F. 71	F. 78	F. 90	R. 68	F. 77	F. 94	F. 86	C. 63	C. 79	C. 68	C. 61	C. 70	C. 66	F. 56	F. 68	F. 58
27	F. 49	F. 70	F. 55	C. 54	C. 70	C. 64	F. 65	C. 73	C. 66	R. 61	C. 70	C. 68	C. 69	C. 73	C. 70	C. 70	C. 84	C. 70	F. 82	C. 96	C. 84	C. 65	F. 75	C. 60	C. 65	C. 66	C. 53	C. 56	F. 63	F. 56
28	C. 58	C. 77	F. 60	C. 69	C. 72	R. 68	C. 70	C. 74	C. 69	C. 67	R. 63	R. 62	C. 70	C. 79	C. 70	C. 64	C. 70	F. 61	F. 76	F. 92	F. 82	C. 59	C. 65	F. 60	C. 48	C. 60	F. 52	F. 58	F. 71	F. 57
29	C. 62	R. 67	R. 65	C. 68	C. 71	C. 64	R. 70	C. 74	C. 68	C. 59	R. 62	R. 67	C. 66	C. 77	C. 70	C. 59	C. 66	C. 61	F. 68	C. 89	F. 80	C. 55	C. 64	F. 61	F. 52	F. 72	F. 60	F. 58	F. 64	C. 53
30	F. 67	? ?	C. 64	R. 61	C. 67	F. 63	F. 67	F. 74	F. 66	R. 50	R. 65	R. 60	F. 64	C. 78	C. 70	F. 62	C. 72	F. 64	F. 72	C. 89	C. 82	C. 55	? 62	? 61	F. 60	F. 83	F. 60	C. 56	F. 66	C. 53
31	F. 60	C. 74	? 62	C. 56	C. 57	C. 63	F. 67	F. 76	F. 66	C. 61	C. 69	? 60	F. 67	C. 77	F. 72	F. 60	F. 75	F. 68	F. 74	F. 94	F. 83	F. 55	C. 70	F. 63	C. 54	F. 75	F. 66	C. 56	C. 69	C. 55

Register of the temperature and face of the sky, &c.—Continued.

Sept. 1858.	Windsor, Nova Scotia. 7 A.M.	2 P.M.	9 P.M.	Montreal, Canada. 7 A.M.	2 P.M.	9 P.M.	Nantucket, Mass. 7 A.M.	2 P.M.	9 P.M.	Rochester, N. Y. 7 A.M.	2 P.M.	9 P.M.	Washington, D. C. 7 A.M.	2 P.M.	9 P.M.
1	FOG. 59	F. 72	F. 57	C. 62	C. 70	F. 64	F. 70	F. 76	F. 66	? 56	C. 75	F. 65	F. 67	C. 80	C. 72
2	C. ?	C. 79	C. 62	F. 59	F. 74	F. 68	C. 67	C. 78	F. 66	C. 61	C. 76	C. 70	F. 68	F. 81	F. 75
3	F. 59	? ?	F. 60	C. 66	R. 67	F. 63	F. 63	F. 75	F. 66	C. 69	R. 67	F. 65	C. 73	C. 85	F. 78
4	F. 62	F. 77	C. 69	C. 69	R. 71	C. 63	C. 70	C. 76	R. 69	C. 63	C. 73	? 64	C. 72	R. 83	F. 64
5	C. 70	R. 76	F. 66	F. 60	C. 74	F. 60	F. 69	F. 77	F. 67	? 61	C. 70	? 64	C. 64	F. 78	F. 72
6	F. 57	C. 70	F. 59	C. 63	C. 70	C. 60	F. 68	F. 76	F. 67	? 58	F. 77	? 65	F. 65	F. 79	F 70
7	F. 59	C. 72	F. 62	C. 57	C. 75	F. 69	F. 69	F. 77	F. 65	? 63	F. 88	? 71	F. 62	F. 79	F. 71
8	C. 65	C. 88	F. 70	F. 63	F. 82	F. 74	F. 70	F. 79	F. 66	? 72	C. 89	C. 76	F. 62	F. 80	C. 74
9	F. 67	? 83	C. 66	C. 72	C. 66	C. 62	F. 69	F. 77	F. 68	F. 73	? 87	? 83	F. 68	C. 82	F. 76
10	R. 62	C. 70	C. 62	C. 61	C. 76	F. 73	FOG. 71	C. 78	FOG. 68	C. 76	C. 88	R. 78	F. 71	F. 85	F. 79
11	C. 62	F. 76	C. 68	C. 62	C. 68	F. 60	C. 70	C. 77	R. 72	F. 61	? 70	? 60	C. 74	R. 71	C. 70
12	C. 69	R. 68	F. 61	C. 54	C. 63	C. 55	C. 64	F. 76	F. 68	? 55	C. 68	? 60	F. 63	F. 73	F. 66
13	F. 51	F. 66	F. 50	C. 55	C. 62	F. 53	F. 64	F. 70	F. 62	F. 52	F. 67	F. 57	F. 58	F. 72	F. 63
14	F. 42	F. 62	F. 46	C. 60	F. 66	F. 64	F. 63	F. 66	F. 58	? 52	F. 77	? 58	F. 56	F. 72	C. 68

Sept. 1858.	Memphis, Tenn. 7 A.M.	2 P.M.	9 P.M.	Austin, Tex. 7 A.M.	2 P.M.	9 P.M.	Hillsborough, Ohio. 7 A.M.	2 P.M.	9 P.M.	Platteville, Wis. 7 A.M.	2 P.M.	9 P.M.	San Francisco, Cal. 7 A.M.	2 P.M.	9 P.M.
1	C. 67	? 78	C. 72	C. 78	F. 97	F. 83	F. 57	F. 74	F. 66	C. 64	C. 76	C. 68	C. 57	F. 69	F. 58
2	F. 75	C. 90	F. 80	C. 78	C. 96	F. 82	F. 61	C. 73	C. 68	C. 68	F. 76	F. 65	F. 58	F. 66	F. 61
3	R. 67	C. 72	C. 69	C. 78	F. 97	F. 86	R. 64	C. 72	R. 66	F. 59	C. 74	C. 59	C. 59	F. 67	C. 60
4	C. 67	F. 72	F. 67	C. 78	C. 73	F. 73	F. 62	F. 71	? 63	C. 57	C. 70	F. 59	C. 60	C. 64	FOG. 57
5	F. 64	F. 81	F. 71	F. 74	F. 88	F. 77	F. 58	F. 73	F. 65	F. 58	F. 84	C. 67	C. 57	C. 59	C. 57
6	F. 70	F. 88	F. 78	C. 76	C. 83	C. 76	F. 62	F. 77	F. 68	C. 68	F. 89	F. 78	F. 58	F. 68	F. 58
7	F. 75	F. 88	F. 79	R. 77	R. 88	F. 75	F. 64	F. 81	F. 73	F. 75	C. 92	R. 75	F. 59	F. 70	F. 58
8	F. 76	F. 88	F. 78	R 75	C. 87	F. 80	F. 69	F. 82	F. 74	R. 62	C. 78	C. 64	C. 60	F. 65	C. 57
9	C. 76	C. 85	C. 76	R. 78	C. 82	F 76	F. 70	F. 80	F. 74	R. 64	R. 76	C. 62	C. 59	F. 65	F. 56
10	C. 74	F. 77	F. 67	F. 74	C. 80	F. 69	R. 73	R. 72	F. 65	C. 56	C. 71	F. 51	C. 58	F. 65	F. 56
11	F. 65	F. 74	F. 63	R. 70	F. 63	F. 72	F. 56	F. 66	F. 59	C. 57	F. 69	F. 52	C. 56	F. 65	F. 56
12	F. 62	F. 78	F. 66	F. 70	F. 84	F. 72	F. 55	F. 66	F. 60	F. 48	F. 68	F. 57	C. 60	F. 65	F. 55
13	F. 64	F. 79	F. 68	F. 66	F. 84	F. 74	F. 54	F. 71	F. 60	F. 50	F. 74	F. 58	C. 57	F. 65	F. 55
14	F. 67	C. 88	F. 73	F. 66	F. 88	F. 79	F. 59	F. 76	F. 66	C. 59	R. 66	F. 62	C. 56	F. 68	F. 54

15	FOG. 39	C. 66	F. 49	R. 56	R. 67	C. 62	F. 62	C. 66	R. 63	C. 60	C. 70	C. 63	R. 67	R. 74	R. 71	C. 68	C. 82	F. 71	F. 66	F. 90	F. 73	F. 60	C. 76	R. 62	F. 56	R. 64	F. 51	F. 56	C. 66	F. 55
16	C. 42	C. 66	R. 66	C. 53	R. 58	C. 56	R. 64	R. 71	F. 66	C. 60	C. 62	C. 56	R. 65	C. 76	F. 62	F. 62	F. 75	F. 63	F. 70	F. 86	F. 70	F. 52	R. 59	F. 53	F. 48	F. 65	F. 53	C. 56	C. 60	F. 58
17	C. 65	C. 77	F. 61	C. 54	C. 60	C. 50	C. 64	F. 68	F. 62	C. 55	C. 50	? 50	F. 58	F. 63	F. 61	F. 60	F. 74	F. 63	F. 70	C. 88	C. 73	F. 47	F. 63	F. 56	F. 50	C. 75	F. 61	F. 57	F. 61	F. 58
18	F. 50	F. 62	F. 50	C. 47	C. 59	F. 52	F. 59	F. 63	F. 54	F. 48	C. 63	C. 59	F. 53	F. 68	C. 59	F. 58	C. 79	F. 63	F. 69	C. 83	C. 72	F. 51	F. 69	F. 60	F. 57	F. 81	F. 65	C. 57	F. 65	F. 56
19	F. 38	F. 57	F. 42	C. 49	C. 59	C. 54	C. 63	F. 69	F. 57	C. 54	C. 66	R. 65	F. 57	F. 72	F. 62	F. 60	F. 80	F. 67	C. 70	C. 80	HAZY. 68	F. 57	F. 75	F. 68	F. 68	F. 88	F. 75	F. 58	F. 69	F. 58
20	C. 41	F. 67	F. 53	F. 54	R. 76	R. 70	F. 60	F. 70	F. 64	? 67	F. 85	? 67	F. 58	F. 75	F. 68	F. 64	F. 80	F. 69	C. 72	C. 83	F. 70	F. 65	F. 81	F. 73	F. 69	F. 85	F. 64	F. 59	F. 73	F. 59
21	F. 57	F. 68	C. 63	C. 66	C. 52	C. 49	F. 66	F. 72	F. 64	C. 69	C. 60	? 56	F. 53	F. 81	F. 72	C. 65	F. 83	F. 71	F. 64	F. 84	F. 66	F. 66	F. 76	F. 66	C. 59	F. 74	C. 62	F. 59	F. 73	F. 58
22	C. 62	C. 55	C. 48	C. 45	C. 47	F. 43	C. 58	C. 60	C. 54	C. 47	C. 52	C. 49	F. 60	F. 65	F. 57	F. 67	F. 81	F. 70	F. 62	F. 86	F. 70	C. 55	F. 64	F. 55	C. 56	C. 65	F. 55	F. 59	F. 69	F. 56
23	F. 42	C. 48	F. 38	F. 40	C. 53	F. 49	F. 51	F. 64	F. 50	? 41	? 60	C. 54	F. 47	F. 59	F. 53	F. 63	F. 79	F. 67	F. 62	F. 57	F. 68	F. 47	F. 60	C. 54	C. 56	C. 75	C. 68	C. 57	C. 68	C. 58
24	F. 39	C. 55	R. 48	C. 49	C. 55	F. 46	C. 56	C. 54	R. 54	R. 41	C. 56	? 48	C. 56	C. 62	C. 58	F. 68	F. 82	F. 73	F. 61	F. 88	F. 72	C. 58	C. 74	R. 60	C. 58	F. 67	F. 52	FOG. 57	F. 70	F. 60
25	C. 46	F. 52	F. 43	F. 41	F. 55	F. 45	F. 51	F. 57	F. 48	C. 44	? 57	? 49	C. 56	C. 58	C. 57	C. 66	C. 68	C. 63	F. 62	F. 90	F. 68	C. 53	C. 64	F. 54	F. 48	F. 71	F. 53	C. 62	F. 69	F. 60
26	F. 34	F. 57	F. 42	C. 45	F. 56	F. 49	F. 54	F. 60	F. 54	? 43	F. 64	? 49	C. 53	F. 63	F. 52	F. 59	F. 75	F. 64	F. 66	F. 89	F. 77	F. 47	F. 64	F. 56	C. 55	F. 76	F. 58	F. 62	F. 73	F. 61
27	FOG. 35	C. 58	F. 45	C. 46	C. 58	F. 49	F. 54	F. 58	F. 55	? 44	? 59	F. 50	F. 46	F. 65	F. 55	F. 58	F. 76	F. 65	FOG. 68	F. 87	F. 73	F. 50	F. 67	F. 57	C. 58	F. 75	C. 65	F. 62	F. 72	F. 58
28	C. 42	C. 56	R. 48	C. 48	F. 60	C. 56	F. 54	C. 57	C. 56	F. 50	C. 70	? 58	F. 47	F. 64	F. 56	F. 64	F. 80	F. 70	F. 67	F. 89	F. 73	F. 52	F. 73	R. 66	C. 60	F. 83	F. 70	F. 60	F. 78	F. 63
29	R. 57	C. 59	C. 53	C. 52	C. 63	C. 59	F. 54	F. 63	F. 56	C. 56	C. 72	F. 70	F. 48	F. 70	F. 62	F. 67	F. 83	F. 73	F. 69	F. 88	F. 75	C. 61	F. 76	F. 69	C. 62	F. 80	C. 62	F. 64	F. 88	F. 66
30	C. 46	F. 67	F. 54	F. 57	F. 63	C. 53	F. 60	F. 67	F. 62	C. 63	R. 64	R. 64	F. 59	F. 79	F. 69	C. 68	F. 82	F. 73	C. 70	FOG. 86	F. 74	F. 64	F. 82	C. 68	F. 60	F. 66	C. 58	F. 63	F. 91	F. 66

Register of the temperature and face of the sky, &c.—Continued.

Oct., 1858.	Windsor, Nova Scotia.			Montreal, Canada.			Nantucket, Mass.			Rochester, N. Y.			Washington, D. C.		
	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.
1	C. 49	C. 56	C. 58	C. 47	R. 52	R. 49	F. 62	F. 70	C. 63	C. 54	R. 49	F. 47	F. 64	C. 72	F. 65
2	C. 61	C. 56	C. 43	F. 42	F. 54	F. 50	F. 52	F. 60	F. 55	F. 43	C. 58	? 51	F. 54	F. 67	F. 57
3	C. 44	C. 55	C. 46	C. 47	C. 55	C. 50	F. 58	F. 66	C. 63	F. 61	C. 78	C. 71	F. 55	C. 70	F. 72
4	C. 52	C. 65	F. 55	C. 54	C. 58	C. 53	F. 64	F. 72	C. 62	C. 55	C. 60	C. 50	F. 67	F. 84	? 73
5	C. 45	F. 55	F. 48	C. 46	C. 55	F. 46	F. 61	F. 65	F. 59	? 51	F. 60	? 50	C. 67	C. 68	C. 55
6	C. 45	C. 50	F. 41	F. 40	F. 53	F. 48	F. 56	F. 67	F. 56	? 47	? 55	? 50	R. 55	C. 58	C. 58
7	F. 37	C. 55	C. 47	C. 41	R. 48	R. 49	F. 52	C. 58	C. 62	C. 61	C. 56	? 55	R. 62	F. 71	F. 68
8	R. 49	R. 60	F. 40	C. 40	C. 46	C. 41	F. 56	F. 56	F. 53	F. 40	C. 46	F. 40	F. 49	F. 61	F. 54
9	F. 34	F. 52	F. 45	R. 40	C. 47	C. 45	C. 53	C. 59	F. 52	C. 42	C. 52	F. 45	F. 48	F. 58	F. 49
10	C. ?	C. 51	F. 42	C. 42	C. 52	F. 46	F. 52	F. 58	F. 54	? 43	C. 56	C. 50	F. 45	F. 60	C. 52
11	C. 37	C. 48	F. 40	C. 44	F. 49	C. 41	C. 55	F. 58	F. 48	C. 47	R. 54	R. 47	C. 50	C. 64	R. 58
12	F. 38	F. 47	F. 38	C. 40	R. 51	R. 47	C. 53	F. 56	C. 53	R. 48	R. 54	R. 53	C. 54	R. 62	R. 59
13	F. 26	F. 54	F. 45	C. 47	R. 50	C. 53	C. 56	R. 61	FOG. 61	C. 50	C. 62	C. 50	C. 62	F. 69	? 64
14	R. 54	R. 63	R. 60	C. 51	C. 55	C. 47	R. 62	F. 68	F. 58	C. 26	C. 53	C. 46	? 57	F. 63	F. 56

Oct., 1858.	Memphis, Tenn.			Austin, Tex.			Hillsborough, Ohio.			Platteville, Wis.			San Francisco, Cal.		
	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.
1	C. 71	F. 83	F. 75	F. 68	F. 88	F. 77	R. 61	C. 65	F. 58	C. 55	C. 63	F. 58	C. 58	C. 62	C. 56
2	F. 71	F. 85	F. 74	FOG. 68	F. 88	F. 76	F. 51	F. 70	F. 64	F. 56	C. 88	C. 78	C. 58	C. 71	C. 57
3	F. 68	F. 85	F. 72	F. 76	F. 89	F. 76	F. 67	F. 80	F. 71	C. 63	C. 78	R. 62	C. 58	F. 71	F. 58
4	F. 68	C. 84	F. 73	C. 73	F. 90	F. 78	F. 65	C. 79	R. 64	C. 52	C. 63	F. 52	C. 59	F. 67	F. 57
5	C. 70	C. 74	F. 71	FOG. 74	F. 88	F. 78	C. 54	F. 62	R. 58	F. 42	F. 68	F. 52	C. 58	F. 64	C. 55
6	F. 71	F. 84	F. 75	C. 73	F. 90	F. 80	C. 53	C. 65	C. 62	C. 58	R. 63	C. 42	F. 55	F. 66	F. 59
7	F. 61	F. 63	F. 52	C. 72	F. 80	F. 65	F. 61	F. 52	F. 45	F. 36	F. 47	F. 36	C. 55	F. 62	C. 57
8	F. 48	F. 69	F. 54	C. 62	F. 82	HAZY. 74	C. 39	F. 52	F. 42	F. 29	F. 45	F. 37	C. 56	F. 59	F. 54
9	F. 49	C. 69	C. 57	F. 75	C. 88	C. 77	F. 35	C. 51	F. 44	F. 32	F. 53	F. 46	C. 56	F. 62	F. 56
10	C. 54	C. 57	C. 58	F. 68	F. 87	F. 73	F. 37	C. 57	C. 51	C. 45	R. 54	C. 46	F. 56	F. 66	F. 55
11	R. 58	R. 60	R. 58	F. 62	F. 78	F. 62	R. 47	R. 50	R. 50	C. 46	C. 56	C. 52	F. 55	F. 76	F. 65
12	C. 54	F. 67	F. 69	F. 60	F. 82	F. 63	C. 51	C. 57	C. 51	C. 49	C. 52	F. 43	F. 60	F. 82	F. 70
13	F. 55	F. 74	F. 65	F. 62	F. 86	F. 73	C. 50	F. 60	C. 56	C. 48	C. 53	F. 43	F. 60	C. 70	F. 55
14	F. 50	F. 66	F. 50	F. 63	F. 83	F. 69	F. 43	F. 53	F. 47	F. 36	F. 55	F. 46	C. 58	C. 69	C. 57

15	R. 53	R. 49	F. 44	C. 45	C. 50	C. 46	F. 53	F. 60	F. 54	C. 41	F. 57	? 45	F. 48	F. 62	F. 51	F. 42	F. 72	F. 56	F. 63	F. 84	F. 71	F. 37	F. 60	F. 52	F. 40	C. 58	R. 56	C. 58	F. 59	F. 55
16	F. 43	C. 51	F. 36	C. 45	C. 50	C. 46	F. 50	F. 60	F. 54	? 40	C. 55	C. 50	F. 42	F. 62	F. 57	F. 56	F. 75	F. 64	F. 70	F. 87	F. 75	F. 49	F. 68	F. 58	R. 58	C. 84	F. 66	F. 55	F. 59	F. 54
17	C. 35	C. 44	C. 31	C. 45	C. 51	C. 47	F. 58	C. 59	F. 52	C. 56	F. 71	F. 55	F. 48	F. 68	F. 58	F. 60	F. 76	F. 67	R. 73	C. 86	F. 76	F. 54	F. 71	F. 59	F. 64	F. 80	F. 68	F. 52	F. 62	F. 53
18	C. 32	C. 54	C. 51	C. 43	C. 65	F. 59	C. 56	F. 53	F. 56	C. 50	C. 75	F. 57	FOG. 48	F. 68	F. 57	F. 62	C. 79	F. 66	C. 73	C. 83	C. 74	F. 53	F. 71	F. 61	R. 52	C. 50	C. 42	F. 55	F. 66	F. 57
19	FOG. 45	F. 71	F. 53	F. 51	C. 70	C. 68	F. 57	F. 66	F. 57	F. 57	C. 74	F. 56	FOG. 53	F. 70	F. 58	C. 63	C. 72	R. 53	R. 57	C. 70	F. 57	F. 56	C. 72	C. 64	C. 37	F. 54	C. 48	F. 50	C. 68	C. 52
20	F. 44	F. 60	C. 46	C. 54	C. 52	F. 46	F. 56	F. 67	F. 55	FOG. 58	F. 61	? 60	F 51	F. 73	C. 63	C. 49	F. 62	F. 49	C. 52	C. 70	C. 58	C. 58	R. 61	R. 52	C. 38	R. 50	R. 40	C. 54	F. 63	R. 59
21	C. 40	F. 48	F. 37	F. 38	C. 54	C. 49	F. 55	C. 56	C. 54	C. 50	C. 60	C. 56	FOG. 55	C. 71	C. 63	F. 44	F. 67	C. 59	HAZY. 60	C. 72	C. 69	C. 45	F. 56	C. 54	R. 40	C. 55	C. 46	R. 58	R. 64	R. 58
22	F. 30	F. 59	F. 45	C. 51	C. 58	C. 54	HAZY. 53	C. 60	F. 56	FOG. 51	C. 55	C. 53	C. 57	C. 97	C. 60	C. 57	C. 73	F. 62	F. 71	F. 80	C. 71	C. 50	C. 61	F. 53	C. 46	F. 58	C. 52	F. 54	F. 59	C. 58
23	C. 48	C. 57	C. 52	C. 53	C. 53	R. 49	C 57	C. 64	C. 57	C. 40	F. 33	C. 40	FOG. 57	F. 71	F. 60	C. 57	F. 76	F. 63	FOG. 68	C. 83	C. 73	C. 47	FOG. 60	F. 53	C. 46	F. 54	F. 50	C. 54	C. 64	C. 59
24	C. 46	C. 42	C. 37	C. 39	C. 43	F. 36	C. 56	R. 52	R. 49	C. 48	R. 47	C. 47	F. 48	C. 59	C. 54	C. 65	C. 74	C. 68	F. 66	F. 78	F. 63	F. 39	F. 54	F. 44	C. 48	C. 60	C. 48	C. 55	F. 60	F. 54
25	C. 38	C. 40	C. 36	F. 32	F. 40	F. 35	C. 45	C. 46	C. 43	F. 42	? 47	? 41	C. 49	C. 60	C. 48	C. 60	F. 72	F. 63	F. 57	F. 84	F. 72	F. 42	R. 55	R. 54	C. 48	C. 60	C. 51	F. 52	F. 61	F. 53
26	C. 38	C. 42	C. 36	F. 31	F. 44	F. 40	F. 43	F. 48	F. 47	? 32	? 47	? 33	C. 39	C. 54	F. 42	C. 64	C. 74	C. 57	C. 73	F. 86	F. 67	C. 50	C. 55	C. 53	C. 51	C. 53	C. 51	F. 54	C. 65	F. 55
27	C. 43	F. 49	F. 45	F. 41	F. 54	F. 40	HAZY. 48	HAZY. 54	F. 51	? 31	? 31	F. 40	F. 33	F. 59	F. 43	C. 63	C. 72	C. 63	F. 58	F. 71	F. 63	C. 48	FOG. 62	C. 59	R. 51	R. 53	R. 51	F. 54	C. 62	F. 57
28	F. 40	F. ?	F. 35	F. 44	F. 50	F. 42	F. 51	F. 59	F. 49	? 33	C. 55	C. 47	F. 36	C. 63	C. 56	C. 57	C. 62	C. 57	F. 49	F. 72	F. 55	R. 55	C. 59	R. 55	R. 50	R. 53	R. 51	C. 54	C. 62	C. 58
29	F. 27	F. 41	F. 38	C. 32	C. 50	R. 46	F. 49	F. 54	C. 49	C. 40	C. 56	C. 66	C. 53	C. 59	C. 62	C. 55	C. 61	F. 56	F. 50	C. 74	F. 54	C. 53	C. 60	F. 53	R. 54	R. 54	R. 46	C. 55	F. 67	F. 57
30	C. 31	C. 51	R. 50	C. 49	C. 57	C. 52	C. 54	R. 58	R. 58	C. 51	R. 63	C. 51	C. 61	F. 67	C. ?	C. 48	C. 62	C. 57	F. 56	F. 80	F. 67	R. 53	C. 56	? ?	R. 44	R. 54	R. 44	F. 52	F. 68	F. 63
31	R. 56	C. 59	C. 52	C. 50	C. 57	C. 51	FOG. 58	FOG. 58	F. 55	C. 50	C. 56	C. 49	F. ?	F. ?	C. ?	C. 57	C. 70	C. 62	F. 66	F. 80	F. 69	C. 44	C. 53	C. 50	F. 40	C. 60	C. 51	F. 52	F. 57	C. 53

Register of the temperature and face of the sky, &c.—Continued.

Nov. 1858.	Windsor, Nova Scotia.			Stanbridge, Canada.			Nantucket, Mass.			Rochester, N. Y.			Washington, D. C.			Memphis, Tenn.			Austin, Tex.			Hillsborough, Ohio.			Platteville, Wis.			San Francisco, Cal.		
	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.
1	C. 52	C. 59	C. 46	R. 47	R. 42	C. 36	F. 53	F. 58	F. 51	F. 47	C. 53	C. 50	F. ?	C. 65	C. 56	? 60	? 63	? 51	F. 51	F. 67	F. 53	F. 47	C. 58	C. 55	F. 40	C. 50	R. 46	C. 54	C. 59	F. 55
2	C. 40	C. 40	F. 36	F. 32	F. 44	F. 32	C. 52	C. 51	C. 47	C. 46	C. 51	. 50	C. ?	C. 61	R. 56	? 50	? 53	? 49	C. 45	C. 66	F. 49	C. 48	F. 57	F. 48	R. 43	R. 48	R. 44	C. 54	C. 59	FOG. 54
3	C. 35	C. 37	C. 35	F. 28	C. 46	C. 40	C. 47	C. 50	C. 47	R. 44	R. 43	C. 45	R. ?	C. 57	C. 53	? 47	? 50	? 48	. 45	C. 61	C. 54	C. 44	C. 51	F. 44	R. 39	R. 46	R. 45	C. 55	F. 58	C. 54
4	C. 32	C. 40	C. 35	C. 39	C. 40	C. 39	C. 49	R. 49	C. 52	R. 45	C. 50	C. 49	C. ?	C. 55	C. 49	? 43	? 52	? 49	C. 49	C. 47	F. .7	C. 43	C. 47	C. 44	R. 44	R. 48	R. 46	C. 54	F. 66	F. 58
5	C. 39	C. 49	R. 45	C. 40	C. 45	C. 42	C. 51	C. 50	C. 49	C. 55	C. 51	C. 44	C. ?	R. 50	R. 50	? 43	? 50	? 46	F. 36	F. 62	F. 42	C. 42	C. 43	C. 42	R. 42	R. 46	R. 40	C. 53	F. 69	F. 59
6	C. 43	C. 44	R. 42	C. 38	C. 43	C. 40	R. 48	R. 51	R. 50	C. 45	R. 47	R. 42	R. ?	C. 52	F. 46	? 43	? 54	? 49	C. 34	F. 71	F. 54	R. 37	C. 43	C. 40	C. 36	C. 45	C. 36	F. 55	F. 69	F. 60
7	R. 43	R. 52	R. 44	S. 34	S. 36	S. 33	C. 50	C. 50	F. 47	C. 43	C. 48	R. 45	F. ?	F. ?	F. 47	? 43	? 48	? 42	F. 48	F. 64	F. 49	F. 37	C. 43	C. 41	C. 36	C. 40	F. 34	F. 56	F. 70	F. 62
8	F. 43	C. 51	C. 44	R. 33	R. 35	R. 35	F. 48	C. 53	F. 48	C. 40	C. 42	C. 40	C. 44	C. 50	F. 46	? 40	? 46	? 43	C. 39	F. 59	F. 43	C. 37	C. 42	C. 39	C. 36	C. 41	C. 33	F. 54	F. 72	F. 59
9	C. 40	C. 42	C. 36	C. 32	C. 32	C. 31	C. 49	C. 54	C. 48	R. 45	R. 36	R. 34	C. 41	C. 50	F. 44	? 38	? 42	? 39	F. 27	F. 62	C. 49	C. 36	R. 38	C. 35	C. 32	C. 40	C. 34	F. 55	F. 70	F. 59
10	C. 34	C. 36	C. 33	C. 28	C. 29	C. 25	F. 44	F. 50	C. 44	R. 33	C. 33	C. 29	F. 38	C. 50	C. 45	? 35	? 47	? 42	C. 3	F. 63	F. 49	C. 34	C. 39	F. 36	C. 30	C. 41	C. 34	C. 54	C. 69	F. 56
11	C. 38	C. 30	C. 29	S. 22	S. 24	S. 23	F. 37	C. 44	C. 35	F. 28	C. 31	C. 29	C. 42	C. 48	R. 43	? 42	? 45	? 42	F. 43	F. 63	F. 45	C. 34	C. 42	C. 39	C. 31	C. 40	C. 36	F. 55	F. 58	F. 54
12	F. 20	C. 27	C. 24	C. 22	F. 26	F. 18	C. 37	S. 37	F. 33	F. 29	? 36	? 51	C. 37	C. 47	C. 45	? 34	? 52	? 48	F. 38	F. 76	F. 57	R. 37	R. 43	R. 41	S. 34	S. 40	C. 32	C. 54	F. 59	F. :2
13	C. 25	F. 34	F. 26	S. 24	S. 29	S. 30	C. 12	C. 38	C. 9	C. 30	C. 39	F. 33	C. 45	C. 50	F. 45	? 39	? 47	? 39	C. 42	F. 62	C. 49	R. 6	C. 38	F. 32	F. 16	F. 32	C. 29	C. 54	C. 59	F. 53
14	C. 20	C. 24	C. 33	C. 19	C. 20	F. 15	F. 36	F. 35	F. 3	R. 25	C. 29	C. 24	F. 32	F. 46	F. 35	? 36	? 62	? 47	C. 54	C. 72	C. 61	F. 27	C. 30	C. 29	S. 24	C. 31	F. 13	FOG. 53	F. 58	C. 53

15	S. 22	S. 27	C. 24	C. 11	C. 25	F. 15	F. 37	S. 37	S. 34	F. 13	C. 38	C. 28	C. 37	C. 38	C. 34	? 41	? 40	? 35	C. 41	F. 51	F. 39	C. 28	F. 30	F. 24	F. 8	F. 30	F. 16	F. 52	F. 53	FOG. 55
16	F. 22	C. 29	C. 25	S. 21	S. 27	C. 24	F. 28	C 37	C. 34	C. 28	C. 31	C. 32	F. 28	C. 37	F. 35	? 26	? 42	? 35	F. 31	F. 55	F. 43	F. 18	C. 32	F. 29	F. 4	F. 26	F. 16	FOG. 51	F. 60	F. 52
17	C. 27	C. 30	C. 32	C. 23	C. 30	F. 30	F. 33	F. 43	F. 37	C. 30	C. 38	C. 35	F. 33	F. 43	F. 39	? 26	? 48	? 37	F. 31	C. 62	F. 47	F. 22	C. 35	C. 30	C. 26	C. 36	C. 16	F. 49	F. 65	F. 56
18	C. 33	C. 36	C. 36	S. 31	S. 35	C. 35	C. 39	C. 46	F. 40	C. 33	F. 30	? 27	F. 30	F. 48	F. 37	? 33	? 42	? 35	C. 50	C. 60	C. 54	F. 31	C. 31	F. 25	C. 17	F. 25	F. 10	F. 56	F. 61	C. 53
19	C. 34	C. 35	F. 30	C. 27	C. 23	F. 19	F. 42	F. 46	F. 36	F. 28	C. 35	? 33	C. 34	C. 40	F. 33	? 25	? 43	? 38	C. 51	R. 53	C. 37	F. 22	F. 28	F. 26	F. —1	F. 25	F. 13	C. 51	C. 58	R. 57
20	F. 24	F. 29	F. 33	S. 22	S. 32	S. 27	F. 32	F. 43	F. 40	F. 31	C. 30	C. 34	F. 27	C. 40	R. 36	? 34	? 53	? 36	F. 26	F. 54	F. 42	F. 24	C. 27	C. 29	C. 14	S. 32	C. 26	F. 57	F. 60	C. 58
21	F. 31	F. 38	F. 27	C. 23	F. 37	F. 21	C. 44	C. 43	R. 33	C. 34	C. 37	C. 35	R. 35	C. 41	C. 36	? 33	? 46	? 41	F. 52	F. 63	F. 48	R. 30	R. 31	R. 29	C. 26	C. 34	C. 30	C. 56	F. 59	F. 58
22	C. 26	C. 36	C. 32	C. 21	C. 29	F. 20	F. 40	F. 45	C. 33	R. 35	R. 42	R. 32	C. 34	C. 41	R. 42	? 36	? 38	? 37	F. 37	F. 65	F. 49	C. 27	C. 32	C. 34	C. 30	C. 34	C. 34	FOG. 57	F. 58	F. 58
23	F. 19	S. 33	S. 34	S. 17	S. 27	F. 27	C. 44	C. 53	C. 43	R. 33	R. 36	R. 34	F. 39	F. 46	C. 39	? 34	? 37	? 34	C. 38	C. 55	F. 41	R. 29	R. 31	R. 30	C. 34	C. 37	C. 32	FOG. 56	C. 59	F. 55
24	S. 33	S. 35	C. 34	C. 26	C. 31	C. 17	C. 41	C. 40	C 38	R. 31	C. 37	C. 34	C. 38	C. 43	C. 43	? 32	? 45	? 37	F. 31	F. 66	C. 59	C. 32	C. 36	C. 34	C. 34	C. 36	C. 33	C. 54	F. 56	F. 49
25	C. 34	C. 38	C. 36	C. 22	C. 27	C. 27	C. 35	C. 37	C. 35	C. 30	C. 31	C. 29	C. 3·	C. 40	F. 37	? 35	? 51	? 45	C. 56	C. 73	C. 67	C. 32	C. 34	? ?	C. 33	C. 37	C. 29	C. 46	F. 54	F. 50
26	C. 34	C. 35	C. 35	C. 26	C. 27	C. 26	C. 34	C. 37	C. 35	C. 30	C. 32	C. 31	F. 37	F. 41	F. 35	? 43	? 48	? 48	C. 65	C. 74	F. 62	C. 31	F. 37	? ?	C. 28	C. 37	S. 34	F. 48	C. 54	F. 50
27	C. 33	C. 36	C. 33	C. 25	C. 27	C. 25	C. 35	C. 37	C. 36	C. 30	C. 35	C. 32	F. 33	C. 40	S.&R. 35	? 48	? 62	? 59	C. 62	C. 75	C. 66	C. 31	C. 32	C. 33	S. 34	S. 36	S. 36	F. 49	F. 58	F. 52
28	C. 28	C. 33	C. 28	C. 22	C. 29	C. 12	C. 35	S. 35	R. 35	C. 30	C. 33	F. 30	S.&R. 36	C. 43	C. 41	? 59	? 53	? 45	C. 67	R. 54	R. 49	R. 47	R. 45	R. 36	C. 32	F. 44	F. 26	F. 48	F. 58	F. 55
29	F. 24	C. 31	C. 31	C. 17	C. 25	C. 16	R. 37	C. 37	F. 32	C. 2	C. 31	C. 30	C. 37	C. 39	C. 37	? 39	? 44	? 38	R. 45	C. 55	F. 49	R. 33	R. 38	R. 35	C. 32	F. 40	F. 26	F. 46	F. 56	F. 56
30	C. 28	C. 34	S. 32	C. 22	C. 28	C. 15	C. 36	C. 44	F. 35	C. 31	C. 30	C. 25	C. 37	F. 45	F. 36	? 34	? 47	? 37	F. 41	C. 58	C. 47	F. 27	F. 33	F. 28	F. 16	C. 30	C. 28	F. 53	C. 56	C. 51

Register of the temperature and face of the sky, &c.—Continued.

Dec., 1858.	Windsor, Nova Scotia. 7 A.M.	2 P.M.	9 P.M.	Stanbridge, Canada. 7 A.M.	2 P.M.	9 P.M.	Nantucket, Mass. 7 A.M.	2 P.M.	9 P.M.	Rochester, N. Y. 7 A.M.	2 P.M.	9 P.M.	Washington, D. C. 7 A.M.	2 P.M.	9 P.M.
1	C. 26	C. 26	F. 20	F. 2	F. 7	F. —4	C. 23	C. 28	C. 26	C. 18	C. 24	C 26	F. 29	C. 38	C. 33
2	C. 12	C. 29	C. 30	C. 18	C. 30	C. 31	HAZY. 28	C. 42	R. 48	C. 30	C. 40	C. 38	R. 34	R. 39	R. 39
3	C. 35	C. 38	C. 36	S. 32	S. 30	S. 22	F. 40	F. 49	F. 43	R. 35	R. 34	R. 32	FOG. 36	F. 48	R. 44
4	S. 24	C. 21	C. 16	S. —2	S. 16	S. 17	C. 38	C. 40	R. 38	R. 25	R. 27	R. 30	C. 45	R. 45	C. 48
5	C. 14	C. 23	S. 21	S.&R. 23	S.&R. 31	S &R. 38	R. 40	FOG. 45	FOG. 48	R. 32	C. 46	? 40	C. 50	C. 57	C. 56
6	C. 26	F. 39	C. 33	C. 36	F. 35	F. 15	FOG. 42	F. 47	C. 40	C. 31	C. 35	? 30	C. 50	C. 54	C. 49
7	F. 18	F. 23	C. 12	F. 3	C. 30	C. 33	F. 40	C. 42	R. 43	C. 31	C. 41	C. 36	R. 43	R. 41	R. 43
8	C. 28	S. 39	C. 40	C. 37	C. 32	C. 23	FOG. 47	R. 45	C. 42	C. 32	C. 27	C. 22	R. 43	R. 40	F. 36
9	C. 24	C. 21	C. 16	F. 10	C. 12	F. 3	F. 30	F. 30	F. 26	C. 15	C. 22	C. 18	F. 25	F. 27	F. 22
10	C. 10	F. 14	F. 11	C. —4	S. 12	S. 21	F. 22	F. 29	F. 34	C. 20	C. 28	C. 31	F. 19	C. 30	C. 29
11	C. 18	C. 32	C. 30	S. 27	S. 26	F. 10	F. 36	F. 40	F. 35	C. 32	? 36	? 28	C. 29	C. 42	C. 38
12	C. 12	F. 13	F. 8	F. —5	C. 10	C. 7	F. 34	F. 36	C. 34	C. 23	C. 33	C. 33	R. 37	C. 46	C. 42
13	C. 0	C. 20	R. 26	R. 23	R. 34	R. 30	C. 29	C. 42	C. 39	C. 40	C. 45	C. 43	C. 38	R. 44	C. 46
14	C. 23	FOG. 24	S. 34	C. 36	C. 36	C. 41	R. 47	FOG. 53	R. 51	C. 45	R. 54	R 47	C. 47	FOG. 57	R. 62

Dec., 1858.	Memphis, Tenn. 7 A.M.	2 P.M.	9 P.M.	Austin, Tex. 7 A.M.	2 P.M.	9 P.M.	Hillsborough, Ohio. 7 A.M.	2 P.M.	9 P.M.	Platteville, Wis. 7 A.M.	2 P.M.	9 P.M.	San Francisco, Cal. 7 A.M.	2 P.M.	9 P.M.
1	? 33	? 52	? 46	C. 44	C. 67	F. 52	R. 23	C. 40	C. 35	F. 32	C. 39	S. 33	F. 43	F. 52	F. 45
2	? 49	? 57	? 54	C. 52	C. 70	C. 67	C. 39	C. 45	C. 44	S. 32	S. 35	S. 23	F. 40	F. 50	F. 42
3	? 52	? 60	? 58	C. 28	C. 26	C. 23	R. 45	R. 49	C. 49	S. 14	S. 25	S. 18	F. 33	F. 46	C. 42
4	? 52	? 53	? 69	C. 29	C. 37	C. 41	R. 52	R. 56	C. 56	S. 21	S. 30	S. 22	F. 39	C. 46	C. 45
5	? 50	? 48	? 44	C. 40	C. 53	F. 40	R. 62	F. 50	F. 38	F. 16	F. 20	F. 8	F. 39	C. 48	C. 46
6	? 36	? 56	? 52	C. 39	? ?	C. 57	F. 28	F. 43	C. 41	C. 7	F. 20	C. 18	R. 39	F. 45	F. 37
7	? 51	? 48	? 40	C. 56	C. 47	C. 40	R. 39	C. 51	C. 41	C. 20	F. 8	F. —4	F. 30	F. 42	F. 36
8	? 26	? 33	? 29	C. 25	C. 35	F. 31	C. 24	F. 24	F. 17	F. —16	F. —2	F. —8	C. 29	C. 44	F. 40
9	? 22	? 34	? 29	F. 23	C. 44	F. 33	F. 10	F. 20	F. 17	F. —18	F. 8	F. 10	C. 33	C. 42	C. 40
10	25	44	38	C. 28	C. 40	C. 39	F. 15	F. 35	F. 32	F. 20	F. 32	F. 17	R. 40	C. 43	C. 44
11	? 39	? 48	? 48	C. 43	C. 66	C. 57	C. 33	C. 40	C. 38	C. 14	C. 30	C. 26	C. 45	C. 51	C. 47
12	? 51	? 64	? 61	C. 56	C. 71	C. 63	C. 38	R. 47	C. 50	C. 22	C. 37	S. 39	R. 41	C. 50	C. 48
13	? 64	? 67	? 64	C. 63	C. 70	C. 64	R. 52	C. 54	C. 51	F. 18	C. 26	C. 15	C. 42	F. 48	C. 44
14	? 68	? 61	? 58	C. 67	C. 70	C. 56	R. 56	R. 56	C. 49	C. 8	C. 20	F. 12	C. 44	C. 51	C. 49

15	FOG. 37	FOG. 37	C. 36	R. 37	R. 34	R. 32	FOG. 54	FOG. 52	FOG. 49	R. 38	R. 35	R. 30	C. 56	R. 56	C. 54	? 40	? 46	? 43	C. 42	C. 60	C. 50	R. 49	C. 40	F. 34	F. 2	F. 20	F. 12	C. 45	C. 49	F. 44
16	C. 34	C. 31	F. 23	S.&R. 22	S.&R. 33	S.&R. 28	C. 40	F. 41	C. 36	R. 29	R. 33	R. 34	C. 43	F. 45	F. 37	? 39	? 49	? 41	C. 49	C. 58	C. 51	F. 28	F. 39	F. 33	F. 10	C. 25	C. 16	C. 44	C. 49	F. 43
17	C. 21	C. 16	F. 11	C. 8	F. 7	C. 0	F. 37	C. 46	C. 38	R. 24	R. 23	R. 21	F. 32	F. 46	F. 37	? 32	? 54	? 42	C. 48	C. 62	C. 55	F. 30	C. 36	F. 32	C. 16	C. 32	F. 32	C. 43	C. 47	C. 46
18	S. 9	S. 9	S. 10	F. —11	C. 3	F. —12	S. 32	S. 28	C. 25	C. 16	C. 18	C. 12	F. 30	F. 35	C. 30	? 33	? 57	? 52	C. 51	C. 71	R. 61	F. 30	F. 44	F. 39	C. 28	F. 36	F. 26	C. 44	C. 50	F. 45
19	C. 7	F. 12	C. 10	F. —13	F. 18	S. 21	C. 28	C. 34	C. 36	C. 17	C. 37	C. 33	C. 28	C. 37	C. 30	? 50	? 47	? 51	R. 56	C. 62	F. 58	C. 40	R. 44	C. 41	F. 20	C. 36	C. 34	C. 44	C. 48	F. 42
20	S. 18	C. 35	C. 28	C. 26	F. 31	F. 11	R. 42	F. 44	C. 39	C. 32	C. 38	C. 37	C. 41	R. 46	R. 45	? 52	? 56	? 53	C. 57	F. 70	F. 56	R. 40	R. 44	C. 46	F. 23	F. 32	F. 14	C. 40	C. 47	F. 44
21	C. 21	C. 29	S. 25	S. 23	S. 30	S. 30	R. 40	R. 44	R. 48	C. 36	C. 44	C. 32	R. 45	R. 50	R. 46	? 43	? 51	? 42	F. 41	F. 67	F. 44	C. 47	R. 44	C. 37	C. 14	C. 32	C. 34	C. 41	F. 51	F. 45
22	C. 37	C. 44	C. 27	C. 18	C. 22	C. 16	C. 33	C. 38	F. 32	C. 31	C. 31	C. 24	F. 42	F. 45	F. 39	? 32	? 56	? 46	F. 30	F. 66	F. 56	F. 28	F. 36	F. 32	C. 16	C. 12	C. 8	F. 39	C. 47	F. 41
23	C. 16	F. 20	C. 22	C. 0	C. 7	C. 4	F. 30	C. 42	C. 40	R. 20	R. 29	R. 28	C. 30	C. 47	F. 45	? 47	? 54	? 43	C. 47	C. 61	C. 50	C. 37	F. 46	F. 38	F. 2	C. 30	F. 14	C. 43	R. 45	C. 45
24	C. 16	F. 18	F. 16	C. —9	C. 3	C. 9	C. 34	C. 40	F. 24	R. 15	R. 19	R. 19	C. 42	F. 39	C. 34	? 41	? 47	? 39	C. 49	C. 54	C. 54	C. 22	F. 28	F. 23	C. 18	C. 35	S. 32	C. 43	C. 49	F. 44
25	C. 12	C. 20	F. 17	F. 14	F. 7	F. 9	F. 23	F. 30	F. 29	F. 15	? 25	? 26	F. 25	F. ?	C. 28	? 33	? 49	? 48	C. 54	C. 56	C. 54	R. 22	R. 34	? 29	S. 35	C. 40	F. 30	C. 43	C. 51	F. 43
26	C. 6	F. 31	C. 29	C. 13	C. 29	C. 31	F. 31	C. 40	F. 39	C. 36	C. 37	R. 35	F. 22	F. 37	R. 37	? 45	? 49	? 48	C. 53	C. 56	C. 55	F. 35	F. 37	C. 38	C. 34	C. 38	C. 32	C. 45	C. 51	R. 49
27	C. 34	S. 40	C. 34	S. 30	S. 29	S. 26	R. 44	F. 44	F. 37	C. 34	C. 30	C. 27	C. 38	F. 50	F. 39	? 48	? 49	? 47	C. 54	C. 60	F. 54	C. 37	C. 49	C. 37	C. 32	C. 40	C. 34	C. 49	C. 52	R. 49
28	C. 27	S. 26	C. 29	C. 20	F. 12	F. —8	F. 34	F. 36	F. 30	C. 29	C. 38	C. 34	C. 37	C. 44	F. 34	? 44	? 46	? 45	C. 53	C. 62	F. 53	C. 35	C. 40	C. 39	C. 35	C. 42	C. 35	R. 47	F. 50	F. 41
29	S. 19	S. 14	S. 11	F. —18	F. 3	F. —14	F. 27	HAZY. 35	HAZY. 33	C. 23	C. 27	C. 26	S. 36	R. 35	R. 33	? 45	? 54	? 55	C. 53	C. 61	C. 62	R. 38	C. 44	C. 43	C. 36	C. 40	S. 36	C. 37	F. 47	F. 45
30	C. 10	C. 10	? 11	F. —21	F. 3	F. 10	C. 30	C. 29	C. 29	C. 23	C. 21	F. 29	C. 32	C. 33	C. 33	? 58	? 64	? 46	C. 52	C. 57	F. 46	R. 44	R. 53	R. 56	C. 36	C. 36	C. 23	C. 40	C. 48	C. 49
31	C. 2	C. 23	? 28	C. 25	C. 32	C. 33	C. 35	R. 40	R. 46	C. 35	R. 37	C. 34	R. 37	R. 40	R. 37	? 37	? 47	? 40	F. 37	F. 57	F. 42	R. 35	R. 39	R. 33	C. 20	C. 22	C. 20	C. 46	C. 52	C. 49

INDEX.